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CLEMSON UNIVERSITY

ANNOUNCEMENTS 1970 - 1971

RECORD 1969 - 1970

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CLEMSON, SOUTH CAROLINA

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This general university catalog contains information of particular interest to prospective students and to undergraduates. Students interested in graduate work should request the Graduate School Bulletin from the Dean of the Graduate School.

The information section on pages 50-102 contains information about admission requirements, expenses, buildings and grounds, housing facilities and ROTC. Educational benefits for veterans and current Selective Service regulations may be found on page 55.

The forty-seven curriculums of the University are listed on page 125 and the Colleges, Schools and their major courses are described in detail beginning of the following pages: Agriculture and Biological Sciences, page 126; Architecture, page 148; Education, page 153; Engineering, page 174; Industrial Management and Textile Science, page 186; Liberal Arts, page 195; Nursing, page 203; Physical and Mathematical Sciences, page 204.

The courses of the University are listed alphabetically in the Description of Courses section beginning on page 222.

For information on admissions, entrance and placement examinations, and transfer credits write the Office of Admissions and Registration. For information on family housing on the campus, write the Associate Director of Housing.

Clemson University offers equal educational opportunity to all persons without regard to race, creed, color or national origin.

This policy applies in all matters, including:

1. Admission and education of students.
2. Availability of student loans, grants, scholarships and job opportunities.
3. Employment and promotion of teaching and non-teaching personnel.
4. Student and faculty housing situated on premises owned or occupied by the University.
5. Off-campus housing not owned by the University but listed with the University for referral purposes.
6. Activities conducted on premises owned or occupied by the University.

New Series, Vol. XLV, April, 1970 No. 2

CLEMSON
UNIVERSITY

RECORD

SEVENTY-SEVENTH YEAR

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1969-70

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LIBERAL ARTS ■
NURSING ■
PHYSICAL AND MATHEMATICAL SCIENCES ■
DESCRIPTION OF COURSES ■
PUBLIC SERVICE ACTIVITIES ■

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UNIVERSITY CALENDAR

SUMMER SESSIONS 1969

First Session

(Classes meet Monday-Friday)

May 19	Matriculation and registration
May 20	Classes begin
June 25, 26	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 30	Matriculation, new students
July 1	Matriculation and registration
July 2	Classes begin
July 4	Independence Day holiday
July 19	Classes meet
August 2	Classes meet
August 6, 7	Examinations
August 9	Graduation

SESSION 1969-70

First Semester

August 18, 19	Orientation, new students
August 20	Registration, all students
August 21	Late registration
August 22	Late registration fee applies
August 22	Classes begin, regular schedule
August 28	Last day for registration
September 4	Last day to add a subject
September 18	Last day to drop a subject without record of drop
September 18	Last day to order diploma for mid-year graduation
October 13	Preliminary reports due
October 18	Homecoming—classes suspended
November 11	Last day to withdraw without having grades recorded
November 11	Last day to drop a subject
November 22	Clemson-Carolina game—classes suspended
November 27–29	Thanksgiving holidays*
December 8	Examinations begin
December 18	Mid-year graduation

Second Semester

January 5	Orientation, new students
January 6	Registration, all students
January 7	Late registration
January 8	Late registration fee applies

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* Follow Thursday, Friday, Saturday schedule on Monday, Tuesday, Wednesday, November 24, 25, 26.

January 8	Classes begin, regular schedule
January 14	Last day for registration
January 21	Last day to add a subject
February 4	Last day to drop a subject without record of drop
February 4	Last day to order diploma for May graduation
March 2	Preliminary reports due
March 14	Spring holidays begin at noon
March 23	Classes resume
April 4	Last day to withdraw without having grades recorded
April 4	Last day to drop a subject
April 8	Honors and Awards Day—classes suspended at 12 noon
April 27	Examinations begin
May 8	Commencement

SUMMER SESSIONS 1970

First Session

(Classes meet Monday-Friday)

May 18	Registration
May 19	Classes begin
June 24, 25	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 29	Orientation, new students
June 30	Registration
July 1	Classes begin
August 1	Classes meet
August 5, 6	Examinations
August 8	Graduation

SESSION 1970-71

First Semester

August 17, 18	Orientation, new students
August 19	Registration, all students
August 20	Late registration
August 21	Late registration fee applies
August 21	Classes begin, regular schedule
August 27	Last day for registration
September 3	Last day to add a subject
September 3	Last day to order diploma for mid-year graduation
September 17	Last day to drop a subject without record of drop
October 10	Homecoming
October 12	Preliminary reports due
November 11	Last day to withdraw without having grades recorded
November 11	Last day to drop a subject
November 21	Clemson-Carolina game
November 25	Thanksgiving holidays begin after last class
November 30	Classes resume

December 7	Examinations begin
December 17	Mid-year graduation

Second Semester

January 4	Orientation, new students
January 5	Registration, all students
January 6	Late registration
January 7	Late registration fee applies
January 7	Classes begin, regular schedule
January 13	Last day for registration
January 20	Last day to add a subject
January 20	Last day to order diploma for May graduation
February 3	Last day to drop a subject without record of drop
March 1	Preliminary reports due
March 12	Spring holidays begin after last class
March 22	Classes resume
April 2	Last day to withdraw without having grades recorded
April 2	Last day to drop a subject
April 7	Honors and Awards Day—classes suspended at 12 noon
April 26	Examinations begin
May 7	Commencement

SUMMER SESSIONS 1971

First Session

(Classes meet Monday-Friday)

May 17	Registration
May 18	Classes begin
June 23, 24	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 28	Orientation, new students
June 29	Registration
June 30	Classes begin
July 31	Classes meet
August 4, 5	Examinations
August 7	Graduation

PERSONNEL

PART I

PART I—Personnel

BOARD OF TRUSTEES

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Edgar A. Brown, *President of the Board*	Barnwell
James F. Byrnes	Columbia
Winchester Smith	Williston
Robert R. Coker	Hartsville
James C. Self	Greenwood
Frank J. Jervey	Clemson
Patrick N. Calhoun	Charlotte, N. C.

TERM EXPIRES 1972

Paul Quattlebaum, Jr.	Charleston
W. Gordon McCabe, Jr.	Greenville
T. Kenneth Cribb	Spartanburg

TERM EXPIRES 1974

A. M. Quattlebaum	Florence
L. D. Holmes	Johnston
E. Oswald Lightsey	Hampton

A. W. Rigsby, *Secretary*	Clemson

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1969

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W. A. Barnette, Jr.	Greenwood
William B. DePass	Rock Hill
Thomas A. Evins	Spartanburg
Henry F. Frierson	Orangeburg
James C. Hair	Rock Hill
Stiles Harper	Estill
Henry M. Herlong	Edgefield
Norman Kirkland	Bamberg
H. J. Kossler	Charleston
Glenn J. Lawhon, Jr.	Hartsville
Edward L. Proctor	Conway

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Walter Thompson Cox, B.S. . . . . *Vice-President for Student Affairs and Dean of Students*

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Rufus Kent Guthrie, Ph.D. . . . . *Director of Division of Biology*

James Edwin Halpin, Ph.D. . . . . *Associate Director of Agricultural Experiment Station*

Jess Willard Jones, Ph.D. . . . . *Director of Resident Instruction and Assistant to the Dean*

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Absalom West Snell, Ph.D., *Head, Department of Agricultural Engineering‡*

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Willis Alonzo King, Ph.D. . . . . *Head, Department of Dairy Science*

Sidney Brooks Hays, Ph.D. . . . . *Head, Department of Entomology and Economic Zoology*

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Taze Leonard Senn, Ph.D. . . . . *Head, Department of Horticulture*

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* See also College of Agriculture and Biological Sciences Staff, including Public Service Activities, on page 389.

† Agricultural Education curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.

‡ Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

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Arthur Kenneth Jensen, Ph.D.	*Director, Vocational Education Media Center*

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Herbert William Busching, Ph.D.	*Head, Department of Civil Engineering*
Lyle Chester Wilcox, Ph.D.	*Head, Department of Electrical Engineering*
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Everett Laitala, M.E.	*Head, Department of Engineering Services*
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Thurman Craig Hardin, Ph.D.,	*Head, Department of Mechanical Engineering*
Samuel F. Hulbert, Ph.D.	*Head, Division of Interdisciplinary Studies*

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Harvey J. Wheeler, Ph.D.	*Head, Department of Economics*
Clinton Howard Whitehurst, Jr., Ph.D.	*Head, Department of Industrial Management*
Thomas Alexander Campbell, Jr., M.Ed.	*Head, Department of Textiles*
William C. Laffoday, M.S.	*Coordinator, Professional Development*
Harold Betts Wilson, B.S.	*Field Representative*

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John Harrison Butler, Ed.D.	*Head, Department of Music*
Robert Stansbury Lambert, Ph.D.	*Head, Department of Social Sciences*

SCHOOL OF NURSING

Geraldine Labecki, Ed.D.	*Dean, School of Nursing*

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† Agricultural Education curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.

* Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

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John Willis Kenelly, Ph.D. . . . . *Head, Department of Mathematics*

Henry Elliott Vogel, Ph.D. . . . . *Head, Department of Physics*

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Robert Walter Henningson, Ph.D., *Assistant Director of University Research*

DIRECTOR OF THE LIBRARY

John Wallace Gordon Gourlay, A.M.L.S. . . . . *Director of the Library*

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ROBERT COOK EDWARDS
President
B.S., Clemson University; LL.D., The Citadel; LL.D., Wofford College

VICTOR HURST
Vice-President for Academic Affairs and Dean of the University
Professor of Dairy Science
B.S., 1938, M.S., 1940, Rutgers University; Ph.D., University of Missouri, 1948

MAIN CAMPUS

Abernathy, Atwell Ray, *Associate Professor of Environmental Systems Engineering.*
A.B., Lenoir-Rhyne College, 1953; M.S.P.H., 1959, Ph.D., 1963, University of North Carolina.

Acorn, John Thomson,[*] *Associate Professor of Architecture.*
B.A., Montclair State College, 1959; M.F.A., Cranbrook Academy of Art, 1961.

Adams, Hewitt Dayne, *Assistant Professor of History.*
B.S., United States Naval Academy, 1937; M.A., Claremont Graduate School, 1964.

Adkins, Theodore Roosevelt, Jr., *Professor of Entomology and Economic Zoology.*
B.S., 1952, M.S., 1954, Ph.D., 1958, Auburn University.

Aiem, Irène Armande, *Visiting Instructor in French.*
Licence es Lettres, The Sorbonne, 1968.

Alam, Kursheed, *Associate Professor of Mathematics.*
B.S., 1941, M.S., 1943, Patna Science College. Ph.D., University of Minnesota, 1963.

Allen, Joe Frank, *Associate Professor of Chemistry.*
A.B., Berry College, 1955; M.S., University of Mississippi, 1959; Ph.D., Georgia Institute of Technology, 1963.

Allen, Robert Max, *Belle W. Baruch Professor of Forestry.*
B.S., 1947, M.S., 1951, Iowa State University; Ph.D., Duke University, 1958.

Alley, Forrest Christopher, *Professor of Chemical Engineering.*
B.S., 1951, M.S., 1956, Auburn University; Ph.D., University of North Carolina, 1962; P. E.

Alphin, John Gilbert, *Associate Professor of Agricultural Engineering.*
B.S., 1960, M.S., 1962, Ph.D., 1965, North Carolina State University.

Amoss, Donald Curtis, *Assistant Professor of Electrical Engineering.*
B.S., 1964, M.S., 1966, Ph.D., 1968, Drexel Institute of Technology.

Anderson, Grant William, *Associate Professor of Zoology.*
B.S., D.V.M., Iowa State University, 1932; M.S., Virginia Polytechnic Institute, 1934.

Andrews, John F., *Head of Department of Environmental Systems Engineering; Professor of Environmental Systems Engineering.*
B.S.C.E., 1951, M.S., 1953, University of Arkansas; Ph.D., University of California, 1964. P. E.

Appell, Stephen Marc, *Instructor in History.*
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1970

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INFORMATION

PART II

PART II—Information

GENERAL INFORMATION

Clemson is a land-grant, state-supported university. Clemson is fully accredited by the Southern Association of Colleges and Schools. Curriculums are accredited by the American Chemical Society, Engineers' Council for Professional Development, National Architectural Accrediting Board, and Society of American Foresters.

The forty-seven undergraduate and forty-four graduate curriculums under the Colleges of Agriculture and Biological Sciences, Architecture, Education, Engineering, Industrial Management and Textile Science, Liberal Arts, and Physical and Mathematical Sciences, the School of Nursing, and the Graduate School form a background of training for the hundreds of occupations and professions in which Clemson graduates engage. The University is organized on a basis whereby it retains a clear entity through the interrelationships of colleges, school, and departments providing a well-balanced fundamental and general educational program.

The enrollment of Clemson has grown from 446 students at the opening of the University in 1893 to 7,021 for the first semester, 1969-70, including 278 at the Greenville and Sumter campuses. Since the opening of the University, through the first semester 1969-70, 58,306 students have attended Clemson, and of this number, 20,474 have been awarded the bachelor's degree. During this same period, 69 associate degrees, 1,357 masters' degrees, and 151 Doctor of Philosophy degrees have been awarded.

ADMINISTRATIVE ORGANIZATION

The government of the University is vested in a Board of 13 members, including 6 elected by the Legislature and 7 life and self-perpetuating members, in accord with the Clemson will. The President of the University is the chief executive and administrative officer appointed by the Board of Trustees; and under the President there are four areas of administration, each headed by a chief administrative officer responsible to the President. The organizational units under each of these officers are outlined below:

I. Vice-President for Academic Affairs and Dean of the University
  A. College of Agriculture and Biological Sciences

- B. College of Architecture
- C. College of Education
- D. College of Engineering
- E. College of Industrial Management and Textile Science
- F. College of Liberal Arts
- G. School of Nursing
- H. College of Physical and Mathematical Sciences
- I. The Graduate School
- J. Extended Programs
- K. The University Library
- L. The Summer Sessions
- M. The Computer Center
- N. ROTC
- O. The Belle W. Baruch Institute in Forestry, Wildlife Science, and Marine Biology
- P. Water Resources Research Institute
- Q. Clemson University at Greenville
- R. Clemson University at Sumter

II. Vice-President for Business and Finance and Comptroller

- A. Accounting Division
- B. Personnel Division
- C. Physical Plant Division
- D. Purchasing Division
- E. Auxiliary Enterprises
- F. The Clemson House Hotel

III. Vice-President for Development

- A. Alumni Relations
- B. Public Relations
- C. Communications Center
- D. Planning and Corporate Support

IV. Vice-President for Student Affairs and Dean of Students

- A. Office of the Dean of Men
- B. Office of the Dean of Women
- C. Office of Admissions, Registration, and Financial Aid
- D. Y.M.C.A. and University Religious Affairs

E. Placement Office
F. Counseling Center
G. Athletic Department
H. Student Health Service
I. Director of Student Activities
J. Department of Bands

REQUIREMENTS FOR ADMISSION

To receive consideration for admission to Clemson, the applicant must, as a rule, present a transcript of his high school record giving evidence of graduation, and submit an official copy of his scores for the College Board tests used as an entrance examination. In reaching an admissions decision, the examination scores along with the student's academic preparation, rank in class, and the recommendation of the high school principal will be weighed carefully.

In addition, students may qualify for entrance by:

(1) Achieving satisfactory scores on the College Board examinations and presenting a South Carolina High School Certificate (awarded by certificate examination). This provision applies only to adult candidates 21 or more years of age or to those who have served at least two years of active duty in the Armed Forces.

(2) Achieving satisfactory scores on the College Board examinations and completing a minimum of 12 high school units. Students in this category must achieve above average scores on the entrance examination. and have superior high school records.

(3) Achieving satisfactory scores on the College Board examinations and meeting the additional requirements for entrance with advanced standing. As minimum additional criteria, the transfer applicant must present a statement of honorable dismissal from the institution last attended, an original transcript of his record from each college or university attended, and an official statement that he is eligible to return to the institution last attended. Candidates meeting these requirements will then be considered carefully in the light of the quality of their previous record, and work completed in other colleges with a grade at least one letter grade higher than the lowest passing mark will be evaluated in terms of equivalent courses in the curriculum at Clemson selected by the student.

Finally, various nonintellective factors will be considered in a few cases where it is impossible to make a positive decision on the strength of aptitude and previous academic performance alone.

There is no application fee, but an admissions deposit is required following the issuance of a provisional acceptance. Instructions concerning this deposit will be included in the acceptance letter.

Application Forms. Forms to be used in applying for admission to the University may be obtained by writing the Office of Admissions and Registration, Clemson University, Clemson, S. C. 29631.

Entrance Examinations. With the single exception of those who already hold a bachelor's or higher level degree from an accredited college or university, all candidates for admission to Clemson on the undergraduate level must complete the College Entrance Examination Board Scholastic Aptitude Test. In addition, all candidates, with the exception of these transferring acceptable college credit in mathematics, should take one of the mathematics achievement tests. Although the score earned on either of the mathematics tests will be considered, it is suggested that candidates take the Level I examination. Applicants who have completed the required tests previously are advised that for a fee of $2 and upon request, the College Entrance Examination Board will furnish Clemson an official transcript of scores. Unofficial score reports from other sources are not acceptable.

Applicants who will have completed two or more years of high school French, German, Russian, or Spanish and who will enroll in a curriculum which includes a modern foreign language should take the appropriate language achievement test. These candidates may qualify for advanced placement with credit in language on the basis of a satisfactory score on this test.

Applicants may secure a BULLETIN OF INFORMATION and an application for the tests from their local high school principal or guidance counselor. Should this literature not be available at the high school, the applicant may write to College Entrance Examination Board, P. O. Box 592, Princeton, New Jersey 08540 (Box 1025, Berkeley, California 94701, for Western residents), requesting a BULLETIN OF INFORMATION, COLLEGE BOARD ADMISSIONS TESTS and a test registration form.

All candidates are reminded to forward applications for the entrance examinations as indicated in the Bulletin of Information, and not to Clemson University.

Applicants for enrollment in Architecture must also take the ARCHITECTURAL SCHOOL APTITUDE TEST which is given at most schools of architecture in November, January, and March. Applications for this test may be obtained from a school of architecture or from Educational Testing Service, Princeton, New Jersey 08540.

Three other very important points are:

(1) Be sure to list Clemson on the application for the College Board examinations as one of the schools to receive your scores.

(2) Consideration will be given to your examination results only in the event that an official application for entrance to the University is on file in the Admissions Office.

(3) Up to five weeks is required for College Board to furnish scores, and you must schedule your tests at a date sufficiently early to allow time for them to be received prior to your anticipated entrance date.

Advanced Placement by Examination. In addition to earning credit by the usual method involving classroom attendance, students may receive credit toward their degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Matriculation. Upon arrival for the opening of the session, new students report to the Office of Admissions and Registration to complete enrollment. A student's matriculation is equivalent to his pledge to conform to the rules of the institution. Any admission gained or matriculation made irregularly is subject to cancellation.

Students from Other Countries. A limited number of well qualified students from other countries are accepted. The application for admission must be in English on the official application form furnished by the Office of Admissions and Registration. Official transcripts of all high school and college level work which the applicant has undertaken should accompany the application. They must also complete the entrance examination requirements discussed previously, although in a few unusual cases a substitute examination is authorized.

In addition to academic and personal qualifications equivalent to those required of United States citizens, the applicant from another country is required to submit evidence of his possessing dollar resources adequate without assistance from the University for at least the first year of his course of study, including round trip travel expenses. The University is unable to grant scholarship or loan assistance to students from abroad, and there is little likelihood that any type of employment may be secured.

If accepted, students from other countries should have a minimum of $1,200 in their possession upon reporting to the University. This amount is sufficient to make the entrance payment which includes tuition, fees, and living expenses for a semester, and for books and supplies. Foreign students will also be required to purchase student accident and health insurance.

EDUCATIONAL BENEFITS FOR VETERANS AND WAR ORPHANS

The Veterans Administration provides educational assistance for veterans and children of deceased or totally disabled veterans who meet requirements of applicable laws and regulations. Any veteran or child of a deceased or totally disabled veteran should communicate with the nearest Veterans Administration office to determine whether or not he is entitled to any educational benfits.

SELECTIVE SERVICE REGULATIONS

Registration. For the benefit of students who become 18 years of age during the school year, provision has been made for such students to register for Selective Service in the Office of Admissions and registration on the campus. The registration is then sent through channels to the registrant's local board.

Deferment. The following Selective Service Regulations published in the summer of 1967 are quoted for the guidance of undergraduates:

"In Class II-S shall be placed any registrant *who has requested such deferment* and who is satisfactorily pursuing a full-time course of instruction at a college, university, or similar institution of learning, such deferment to continue until such registrant completes the requirement for his baccalaureate degree, fails to pursue satisfactorily a full-time course of instruction, or attains the twenty-fourth anniversary of the date of his birth, whichever occurs first.

"In determining eligibility for deferment in Class II-S, a student's academic year shall include the 12-month period following the beginning of his course of study.

"A student shall be deemed to be satisfactorily pursuing a full-time course of instruction when, during his academic year, he has earned, as a minimum, credits towards his degree which, when added to any credits earned during prior academic years, represent a proportion of the total number required to earn his degree at least equal to the proportion which the number of academic years completed bears to the normal number of years established by the school to obtain such degree. For example, a student pursuing a four-year course should have earned 25% of the credits required for his baccalaureate degree at the end of his first academic year, 50% at the end of his second academic year, and 75% at the end of his third academic year.

"It shall be the *registrant's* duty to provide the local board each year with evidence that he is satisfactorily pursuing a full-time course of instruction at a college, university, or similar institution of learning."

EXPENSES

Settlement of University Fees. The schedule of semester charges for all undergraduate students—full-time, part-time, and auditing—is shown on the pages which follow. The entire semester's expenses are due and payable at the beginning of each semester, and no student is officially enrolled until all semester expenses have been satisfied. In special cases the University will accept at the beginning of a semester a non-interest bearing promissory note for a portion of the semester residence-hall rent and semester-plan board fee. Amounts up to $65 for room rent and $115 for board fee may be included in the note. In such cases, a note for the first semester charges will be due October 10, and a note for the second semester charges will be due March 1.

A $60 advance payment of room rent is required for a room reservation for the fall semester. This payment must be made by cash, check or money order and should be sent to the Residence Halls Manager's Office with the completed "Student Application for Room Reservation" card not later than July 1. The $60 advance payment of room rent will be deducted from the amount otherwise due for the first semester's expenses. All other transactions relating to payments should be conducted with the Accounting Division. All checks and money orders should be made payable to Clemson University. A personal check given in payment of University expenses which is returned by the bank unpaid, immediately creates an indebtedness to the University.

The University reserves the right to adjust charges to current costs.

Past Due Student Accounts. Any indebtedness to the University which becomes past due immediately jeopardizes the student's enrollment, and no such student will be permitted to graduate or register for a subsequent semester or summer school term. Further, any student who fails to pay all indebtedness to the University may not be issued an honorable discharge, transcript, or diploma.

Refund of Academic Fees for Students Enrolled for Less than a Full Semester. No adjustments in charges will be made on a semester's tuition and fees after five weeks from the date classes begin for the semester. Charges for periods of attendance of five weeks or less during a semester shall be made on the following basis:

Two weeks or less	20%
More than 2 but not more than 3 weeks	40%
More than 3 but not more than 4 weeks	60%
More than 4 but not more than 5 weeks	80%
More than 5 weeks	100%

Special provision has been made for a student who is required to discontinue his enrollment to report for active duty in the Armed Forces of the United States. Such students shall be charged for tuition, maintenance and activity fee, and medical fee on a daily pro rata basis, holidays excepted, instead of the percentage basis stated above, provided that such discontinuance of enrollment is the result of circumstances, conditions, or actions over which the student has no control.

Refund of Dining Hall and Residence Hall Fees. Specific information relating to living-expense refunds is given in the sections on dormitories and dining hall.

Schedule of Charges. The schedule of semester charges for the 1970-71 sessions is as follows:

SCHEDULE OF SEMESTER CHARGES 1970-71 SESSION

Resident of South Carolina (Full-time student)

	Men	*Women*
Tuition	$ 75.00	$ 75.00
Matriculation Fee	5.00	5.00
University Fee	198.00	198.00
Medical Fee	25.00	25.00
Semester Total Excluding Room and Board	$303.00	$303.00

Non-Resident of South Carolina (Full-time student)

	Men	*Women*
Tuition	$200.00	$200.00
Matriculation Fee	5.00	5.00
University Fee	423.00	423.00
Medical Fee	25.00	25.00
Semester Total Excluding Room and Board	$653.00	$653.00

Room:

West Campus (Air-Conditioned With Telephones)	
Johnston Hall:	
New Section A-F	$195.00
Old Section F	165.00
Donaldson Hall	210.00
Bowen Hall	210.00
Wannamaker Hall	210.00
Bradley Hall	210.00
Norris Hall	210.00
East Campus (Air-Conditioned With Telephones)	
Mauldin Hall	210.00
Barnett Hall	210.00
Manning Hall	210.00
Lever Hall	210.00
High Rise 3	210.00
West Campus (Air-Conditioned Without Telephones)	
Johnstone Hall:	
Section D, E	150.00
Benet Hall	180.00
Young Hall	180.00
Cope Hall	180.00
Geer Hall	180.00
Sanders Hall	180.00
West Campus (Without Air-Conditioning or Telephones)	
Johnstone Hall:	
Old Sections A, B, and C	135.00

	Men	*Women*
Board (5-day plan, Monday through Friday)	$220.00	$220.00
Board (7-day plan)	$275.00	$275.00

Part-time Student. Undergraduate students taking less than 12 semester credit hours will be charged each semester according to the following schedule. These fees do not provide for admission to athletic events, concert series, etc.

	S. C. Resident	*Non-Resident Student*
Matriculation Fee (non-refundable)	$ 5.00	$ 5.00
Tuition (per semester hour)	6.00	16.00
University Fee (per semester hour)	13.00	28.00

Auditing. Charges for auditing are made each semester according to the following schedule:

Tuition (per semester hour)	$ 3.00	$ 8.00
University Fee (per semester hour)	7.00	14.00

Graduate Students. For further information concerning advanced degrees see *The Graduate Bulletin,* which may be obtained from the Office of the Dean of the Graduate School.

Late Registration Fee. To prevent or reduce the problems incident to late registration, registration schedules are set for specific days, and certain definite procedures are outlined. A student has not completed registration until all of the required steps are taken, the final one being the return of the properly signed Class Registration Card to the Office of Admissions and Registration. Any student who fails to register for classes on the prescribed class registration days will be charged a late registration fee of $10. This late registration fee applies to full-time and part-time students.

Late Payment Fee. Any student who registers for classes on or before a designated date each semester has three additional working days to make satisfactory settlement of all expenses without being charged a Late Payment Fee. Once begun, a Late Payment Fee of $5 per day will be charged until satisfactory settlement of all fees is made.

Definition of Residence for the Purpose of Determining Status for Enrollment in Clemson University

1. A resident student is one who was continuously domiciled in South Carolina for twelve months immediately preceding his initial enrollment in the University. The term "domiciled in South Carolina" excludes those students in the State primarily to attend the institution and whose abode in South Carolina has been established as a technical bar to the higher tuition and fee charges.

2. Attendance at an educational institution is usually interpreted as temporary residence. Accordingly, a student neither gains nor loses residence solely by such attendance. Registration for voting, the act of voting, purchase of property, payment of taxes and employment in South Carolina are not necessarily by themselves proof of residence in the State for the purpose of enrolling in the University; nor does birth in South Carolina or direct descent from

South Carolina forebears necessarily prove domicile in South Carolina.

3. The residence of a married woman is that of her husband, if living together; however, a wife not living with her husband may establish separate domicile. A non-resident woman who marries a resident of South Carolina shall be accepted as a resident student at the beginning of the next semester following such marriage; and a resident woman who marries a non-resident shall keep her residence status so long as she maintains continuous enrollment in the University. A non-resident man who marries a resident woman does not thereby gain resident status.

4. The residence of a minor child (under 21 years of age) is that of the father; or of the mother if the father be not living or if the parents are separated and the child habitually resides with the mother; or, if both parents are dead, with his legally appointed guardian, or anyone else with whom he habitually resides in the absence of formal legal designation.

5. A minor may become emancipated (freed from parental domicile) through marriage, formal court action, abandonment by parents, or positive action on his own part evidential of his alienation or parental domicile. To qualify under the latter category, a minor must have completely separated himself from the parental domicile and have proved that such separation is complete and permanent. Mere absence from the parental domicile is not proof of its complete abandonment. If an applicant can provide adequate and satisfactory proof of complete emancipation and of his having come to South Carolina with the intention of establishing domicile, he may be granted resident classification at the next enrollment occurring after the expiration of twelve months following establishment of domicile, excluding time spent as a student at the University. The burden of proof of domicile and emancipation shall be upon the applicant.

6. If it is established to the satisfaction of the University that parents have moved to South Carolina with every intention of remaining permanently and establishing themselves as citizens of the State, the dependent children of such parents may be classified as resident students at the first enrollment after the parents move into the State. If the parents of a resident student move to another state with the intention of establishing domicile there, the student shall at the first enrollment after twelve months from the date of establishment of said home by his parents be classified as a non-resident student; however, the student may continue in resident

status if he reaches 21 years of age within the twelve-month period, or if he establishes evidence of emancipation.

7. A person enjoying majority privileges (over 21 years old or an emancipated minor) who has resided in South Carolina continuously for twelve months immediately preceding his initial enrollment in the University shall be classified as a resident. If, after enrollment, such person can provide adequate and satisfactory proof of his establishing domicile in South Carolina and his intention to remain permanently as a resident of the State, he may be granted resident classification at the next enrollment occurring after expiration of twelve months following establishment of domicile exclusive of time spent as a student at the University.

8. Dependents of members of the Armed Services and Federal employees stationed in South Carolina are permitted to attend the University, if accepted, by paying resident fees without regard to resident status, provided that if such military personnel or employees are ordered away from the State, their dependents may continue to have this privilege while they attend the University.

9. Children and dependents of regularly employed Clemson University personnel are permitted to attend the University, if accepted, by paying resident fees without regard to residence status, provided that if such person terminates University employment and departs the State, the child or dependent may retain this privilege so long as continuous enrollment is maintained in the University.

Any student or prospective student in doubt concerning his residence status must bear the responsibility for securing a ruling by stating his case in writing to the Dean of Admissions and Registration.

Books and Supplies. The cost of books is not included in the Schedule of Semester Charges. The cost of books and supplies at the beginning of the semester will be approximately $50, except for students enrolling in Architecture the cost will be approximately $75.

Student Depository. For the convenience of students, the University operates a depository in the Bursar's Office where money can be deposited and withdrawn as the occasion may demand. This service is purely local. Students are urged to deposit their money and not to keep it in their rooms.

Optional Expenses. It is not possible to give an estimate of a student's expenditures for such amusements as dancing, motion pictures, etc. This depends largely upon the disposition of the student. The University endeavors to reduce to a minimum the temptation to spend money needlessly, but the authorities cannot be responsible for a student's private expenditures. This must be a matter between the student and his parents.

Transcripts. Official transcripts of scholastic records are issued on request. One transcript is furnished free; additional copies are issued for $1 each. Remittances for transcripts should be made payable to Clemson University, but should accompany transcript requests and should be mailed to the Office of Admissions and Registration.

STUDENT HOUSING

The University residence halls will accommodate 5,190, two students being assigned to a room. The University also has 289 individual units for its married students. All unmarried first-year students entering the University for the first time, not residing with parents, guardians or close relatives, are required to live in University owned residence halls. After the freshman year, students under twenty-one years of age may secure permission to live off campus by having parental permission on file in the Residence Office and approval of the Office of Student Affairs. Students who are assigned a room in University residence halls will be required to sign a Clemson University Residence Hall Contract relating to terms and conditions of occupancy for the full academic year.

Application for Residence Hall and Advance Payment. An application for residence hall accommodations will be forwarded to those students who are accepted by the University for the fall semester. These applications are to be completed and returned with a $60 advance room payment to the Residence Hall Manager's Office at the earliest practicable date.

Students who have made an advance payment and later decide not to enroll or to live in the residence hall may obtain a refund of the advance payment provided notification of intent and request for refund is received at the Residence Hall Manager's Office prior to July 1. When such notification and refund request is not received by the deadline date, no refund of advance payment will be made.

Refund of the advance payment will not be made to students who apply for assignments after July 1.

Normally, residence hall accommodations are available to those students who enter the University at the beginning of the second semester, therefore, the advance payment is not now required of students entering at this time.

Assignment Preference. Students should indicate on their application their preference of room(s) and roommate. Priority of room assignments is given to continuing students who file application and make advance room payments during the priority periods established by the Residence Halls Office. Preferences will be honored provided space is available in the desired residence hall and the request does not require exceptions to existing assignment procedures.

Notification of Assignments. As soon as room assignments are made, students are advised of the assignment and furnished information regarding occupancy.

Assignment Changes. Students who desire to move from the assigned room may apply at the Student Residence Office to change rooms. A service charge of $4 is charged for moving, also charges will be made for students moving from a lower- to a higher-rated room. Rental refunds are made to students moving from a higher- to a lower-rated room on a prorated basis.

Opening and Closing of Residence Halls. The University residence halls officially open for undergraduate students at 8 p. m. the day prior to matriculation date for new students and close at 8 p. m. the day scheduled for graduation exercises of the term or semester. Residence hall fees cover only the time between the day before matriculation and the scheduled date of graduation exercises or end of term when no graduation exercises are scheduled.

For official holidays which occur during the course of a semester, the University reserves the right to close certain halls and to require students remaining on the campus to move to another hall for the duration of the holiday period.

Student Responsibility for Damages. The University holds resident students responsible for any damages other than normal wear that occur to their rooms and furnishings. Damages will be assessed by the University and the student will be billed for repairs or replacements. Students should inform University officials immediately upon occupancy of any conditions reflecting prior damages which have not been corrected.

Responsibility for Student Possessions. Although every precaution is taken to maintain adequate security, the University cannot assume the responsibility for the loss of or damage to student possessions resulting from any cause.

Refund of Residence Hall Fee. Except for the stated regulations governing the $60 advance payment to reserve a room for the first semester, refunds, when authorized, will be made on a daily pro rata basis.

Extra Residence Hall Charges. Extra charges are made to students who occupy residence halls before or after the dates established for a semester or term.

Students who are required by the University to be on campus prior to and after the scheduled term or semester may upon the approval of the Vice-President for Student Affairs be exempted from paying the extra residence hall charges.

Reservation of Right to Change Fees and Regulations. The University reserves the right to make changes in its fees, charges, rules, and regulations.

RESIDENCE HALLS

West Campus. The University has available 3,606 spaces in eleven residence halls. Ten of these halls are air-conditioned. Only the newer "A" and "F" annexes are air-conditioned in Johnstone Hall. Each room in Benet, Young, Cope, Geer, and Sanders Halls is air-conditioned and has walk-in type clothes lockers, individual study desks, single beds, and chairs. A lavatory is also installed in each room. Rooms in new annexes "A" and "F" of Johnstone Hall are equipped similarly to those in the halls above. Donaldson, Bowen, Wannamaker, Bradley, and Norris Halls are air-conditioned, carpeted, and furnished with clothes lockers, individual study desks, single beds, and chairs. Rooms in Johnstone Hall other than new "A" and "F" annexes are not air-conditioned and are furnished with individual clothes lockers, bunk-type beds, a study table and chairs. A lavatory is installed in each room.

All residence halls on the West Campus are men's residence halls. See *Schedule of Semester Charges* for rates.

East Campus. The University has available 1,584 spaces in five residence halls. Two of these halls, Mauldin and Barnett, are modern four-story structures with wall-to-wall carpeting, air-conditioning, and a rooftop deck. Each will house 144 students in 72 rooms. Rooms are arranged in suites of six, accommodating 12 students. Each suite provides a study, bath, washing and drying facilities. Each room contains two closets, two chests of drawers with wall-hung mirrors, single beds, individual study desks, lamps, and chairs. The other three, Manning Hall, Lever Hall, and Hi-Rise No. 3, are eleven-story structures, fully carpeted and air-conditioned. Each will accommodate 432 students. Rooms are arranged in suites of six accommodating 12 students. Each room contains two closets, two chests of drawers with wall-hung mirrors, single beds, individual study lamps, desks, and chairs. Draperies are to be provided by occupants. Studies and laundry room are available on each floor. The first floor is designed for group living. It includes lounges, a kitchenette, T.V., and recreational rooms. The basement floor includes club rooms, storage areas, and a large room equipped with coin-operated washers and dryers.

Both men residence halls and women residence halls are located on the East Campus. See *Schedule of Semester Charges* for rates.

MARRIED STUDENT HOUSING

Clemson provides comfortable and economical housing for its married students. There are three housing areas consisting of 139 single Prefab units, 100 East Campus apartments contained in 50 duplex buildings, and 50 Littlejohn apartments in 11 buildings.

All married student housing units have two bedrooms, living room, kitchen and bath. East Campus apartments are the newest and are equipped with stove and refrigerator. The Littlejohn apartments and Prefabs are not equipped with stoves and refrigerators.

Booklets describing these facilities are available and will be furnished upon request to the Housing Office of the University. Monthly rental fees are: Prefabs, $36; Littlejohns, $51 for interior and $54 for end units; East Campus, $69.

STUDENT FOOD SERVICE

The University Dining Halls provide several food service plans for the students:

(1) A 5-Day Board Plan (15 meals) Monday through Friday—holidays excluded. The fee for this plan is $440 per year and may be paid in two installments—one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

(2) A 7-Day Board Plan (21 meals) Monday through Sunday—holidays excluded. The fee for this plan is $550 per year and may be paid in two installments—one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

Both the 5-Day and 7-Day Board Plans will begin the first day of classes and end on the day which is scheduled for graduation. (These dates are listed in the University Calendar appearing in this catalog.) Individual meals may be obtained in the student dining halls prior to the day classes begin.

(3) Students who are not on a board plan may purchase tickets for individual meals at prevailing prices. Except on special occasions, a-la-carte service will not be offered in the Student Dining Halls.

All students who enter the University for the first time from high school or preparatory school and who live in University residence halls are required to subscribe to either the 5-Day or the 7-Day Board Plan. Either the 5-Day or the 7-Day Board Plan is also recommended to upperclassmen who reside in University residence halls.

Upperclassmen and graduate students have the option at the time of their enrollment of electing either the 5-Day or the 7-Day Board Plan provided they agree to pay the board-plan fee for the period of their enrollment during the academic year.

A student having selected the 5-Day or the 7-Day Board Plan for the academic year may not withdraw as long as he remains enrolled, except in the case of marriage or circumstances which are determined by the University to be beyond his control.

LAUNDRY–DRY CLEANING

A plant with modern equipment is conveniently located on campus to service the laundry and dry-cleaning requirements of the student. Reasonable prices are charged for individual items on a cash-and-carry basis.

The University will not be liable for lost or damaged items unless reported within two days after the delivery date, and then for not more than the actual depreciated value of such articles as have been lost or damaged.

Coin-operated washing machines and dryers are available in the laundry building and several of the dormitories.

A commercially operated student linen-rental service is also available. Information regarding this service will be forwarded to all students who are accepted for enrollment in the University.

MEDICAL EXAMINATIONS

Completion of a medical history and physical examination record is required of all new students entering Clemson University for the first time. This examination must be completed by the student and the student's own physician or the health service of the school from which he graduates or transfers. This examination must be reported on a special form provided for this purpose by the University and mailed directly to the Director of Student Health Service. This should be received at least four weeks prior to matriculation to give time for processing; otherwise registration may be delayed. Incomplete forms will be returned.

The University requires that all new students have a current tetanus toxoid series or booster (within five years), a smallpox vaccination (within four years) and also immunization against poliomyelitis. The oral (Sabin) type vaccine is preferred. All new students are also required to have a skin test for tuberculosis within one year prior to admission. If this test is positive, a chest X ray is also required. All positive reactors will then be required to have an annual chest X ray. These follow-up X rays after admission will be done at the Student Health Service.

STUDENT HEALTH SERVICE

Student Health Service: Cost per Semester $25. Payment of the Student Health Service fee is required of all students living in University residence halls and all full-time students even though they do not reside in University housing. The Student Health Service maintains a new building with a complete outpatient department and a 34-bed hospital. The staff consists of three full-time physicians, including the director, a psychiatrist, ten full-time registered nurses and a full-time registered laboratory technician and a full-time registered X-ray technician. In addition, a sufficient number of nurses' aides, secretarial workers, orderlies and maids for 24-hour-a-day operations are employed. The best of modern equipment is available for student use.

The Student Health Service at Clemson University has several important functions. All of these are aimed at keeping the student in good health so that he may effectively pursue his school work. There is, of course, the basic function of medical care for the ill and injured. This is a vital part of its work. In addition to this, the Student Health Service attempts to put strong emphasis on health rather than illness. This begins with the entrance medical form. In laying out this form an attempt is made to get information, examinations and preventive medical procedures carried out to better equip the staff in protecting the student from illness and to serve as a guide for the care of pre-existing medical problems.

As the student progresses through his academic experiences, other procedures may be required or highly recommended. These are primarily an effort to teach the individual self-responsibility for maintenance of his own health and locate possible hidden diseases. The Health Service also has the position as the source of medical information as well as responsibility for indicated medical action: diagnostic, therapeutic and preventive.

The medical fee paid by each student covers the services of the University physicians and health service staff for most illnesses and injuries occurring on the campus. There are certain things, however, that it does not include, such as fees for routine physical examinations for employment or transfer to another school and fees for outside physicians when called in for consultation, medical or surgical services performed away from the University or for accidents occurring off the campus. The fee also covers medication for acute illness but not for chronic illness lasting over two weeks or for pre-existing illness. Although ambulance transportation to a general hospital for serious illness or injury occurring on campus will, of course, be arranged, the expense for this service is the responsibility of the student. Transportation for less urgent ailments and routine visits can be arranged through the Health Service at the expense of the student.

The right of the Director of the Student Health Service, with the approval of the proper University authority, to obtain any of these extra services in behalf of any student under his care is hereby expressly reserved.

The Student Government, with full approval of the administration, offers a plan of accident and sickness insurance to full-time students. Each year, prior to the beginning of the fall semester, complete information on this insurance plan will be sent to students. This insurance is inexpensive and is designed to cover major medical expense not covered by the Health Service. It is highly recommended.

UNDERGRADUATE FINANCIAL AID

General. The Office of Student Financial Aid, operating in conjunction with the University Honors and Awards Committee, is responsible for coordinating all types of financial assistance administered by the University except those honors and awards which are presented for special achievement and extracurricular grants-in-aid. Currently available financial aids consist of scholarships, student loans, and part-time employment. It must be realized that any program of financial assistance can only be supplementary and that the basic financial responsibility remains that of the applicant and his parents.

Application Procedure. Beginning in January of each year all eligible students may apply to the Student Financial Aid Office for any type of financial assistance desired for the coming school year. Prompt consideration may be afforded only those applications submitted directly to that office rather than to the individual colleges, schools, and departments. All requests—except for part-time employment—must be supported by a Parents' Confidential Statement filed directly and renewed annually with the College Scholarship Service, Box 176, Princeton, New Jersey 08540. Action on requests for aid will be based upon scholastic and activity records, eligibility to attend Clemson, and financial resources. Prospective students must have received their final acceptance for enrollment from the Admissions Office before complete action may be taken upon their requests for aid. Applicants will be notified when they are selected for specific types of assistance and should promptly indicate their acceptance. The Office of Student Financial Aid reserves the right to consider only those aid applications filed with that office, prior to cutoff date(s), and supported by requisite financial information (from College Scholarship Service). Further information and application forms may be secured by contacting the Student Financial Aid Office, Tillman Hall, Clemson University, Clemson, South Carolina 29631. Telephone 654-2421, Extension 411 (Area Code 803).

SCHOLARSHIPS FOR FRESHMEN

These awards will be based upon high school records, entrance examination scores, and other qualifications established by the selection committees. Completed entrance and scholarship applications, together with a transcript of high school work through the first semester of the senior year, must be submitted by March 1 in order to be considered. For purposes of scholarship application, the College Entrance Examination Board tests should be taken in time to allow our receipt of scores not later than March 1.

Marshall Williams and Grace Cornett Bell Memorial Scholarships. Income from a fund donated by Mrs. Bell and family provides one or more annual awards for students (freshmen or upperclassmen) enrolled in the College of Liberal Arts or the College of Physical and Mathematical Sciences with preference afforded those concentrating in mathematics or English curriculums. Selection is based upon academic progress, moral character, and financial need.

E. V. Correll Scholarship. A $500 award is made available annually by the Palmetto Section of the American Association of Textile Chemists and Colorists to a student (freshman or upperclassman) majoring in Textile Chemistry. Selection is based upon need and scholarship.

Dow Chemical Co. Scholarships. Two $500 awards are available annually to students (freshmen and upperclassmen) majoring in Chemical Engineering.

Educational Opportunity Grants. Non-reimbursable Federal grants, renewable if satisfactory academic progress is maintained, are available from the University for those entering freshmen of exceptional financial requirements. Grants must be matched by scholarships, loans, or other aid. Selection is based upon financial need and academic promise.

Edgar and Emily Hesslein Scholarships. Income from a fund donated by Neuss, Hesslein, and Company provides two $600 scholarships annually. Preference is afforded residents of Marlboro County, South Carolina. Selection is based upon scholastic excellence and financial need. Renewal subject to academic achievement.

Federal Nursing Scholarships. Federal grants, renewable if satisfactory progress is maintained, are available from the University for those entering freshmen of exceptional financial need enrolled in the baccalaureate Nursing program. Selection is based upon academic achievement and potential and financial need.

Ira S. Hurd Scholarship. A $500 award is made available annually by the Palmetto Section of the American Association of Textile Chemists and Colorists to a student (freshman or upperclassman) majoring in Textile Chemistry. Selection is based upon need and scholarship.

Sherwood E. Liles ('00) Engineering Scholarship. Income from a fund donated by his four sons provides an annual $500 scholarship to a student in the College of Engineering. Normally renewable provided satisfactory academic progress is achieved. Selection is based upon academic ability, financial need, extracurricular activities, and South Carolina residence.

Jonathan Logan Scholarships. Two $2,000 awards, to be paid in equal installments during four years of satisfactory undergraduate study, are provided annually by the David Schwartz Foundation to be available to freshmen who enroll in the College of Industrial Management and Textile Science.

William J. Neely Scholarships. Funds donated by friends and associates of the late William J. Neely provide annual $500 scholarships for entering freshmen. May be renewed if academic achievement indicates such renewal to be appropriate.

R. F. Poole Alumni Scholarships. To recognize outstanding academic achievement and potential, renewable $1,000 scholarships are awarded annually to incoming freshmen.

George E. and Leila Giles Singleton Scholarships. Income from a fund donated by Mr. G. H. Singleton ('19) provides an annual $300 award for a farm boy or girl who enrolls in the College of

Agriculture and Biological Sciences. The award is for an entering freshman and may be renewed for an additional year.

South Carolina Electric and Gas Company Scholarship. A $500 scholarship is available each year to a student whose parents or guardians are customers of the South Carolina Electric and Gas Company or customers of the Department of Public Utilities of Orangeburg, Winnsboro, or McCormick. Recipient must be in upper one-third of class scholastically, have demonstrated outstanding leadership qualities, and require financial assistance. Renewal subject to academic achievement.

South Carolina Fresh Fruit and Vegetable Association Scholarship. A $1,200 award, to be paid during four years of satisfactory undergraduate study, is available annually to a male South Carolinian who enrolls in the Horticulture (Fruit and Vegetable major) curriculum.

South Carolina Pest Control Association Scholarship. A $200 award is available annually for an Entomology major (entering freshman or upperclassman). Selection is based upon scholarship, leadership, character, and financial need.

South Carolina Poultry Improvement Association Scholarships. A $300 award is available annually to a freshman majoring in Poultry Science. An additional $300 award is available each year for a sophomore, junior, or senior.

Southern Railway Scholarships. Two renewable annual awards of $1,000 plus tuition and fees are available to entering freshmen. Priority is afforded sons and daughters of Southern Railway System employees residing in South Carolina. Selection is based upon scholastic excellence and financial need.

J. P. Stevens & Co. Scholarship. A $2,000 award, to be paid in equal installments during four years of satisfactory undergraduate study, is available annually to a freshman who enrolls in a Textile curriculum.

Strom Thurmond Scholarships. Income from a fund donated by Senator Strom Thurmond provides two or more annual grants for worthy and needy entering freshmen from the State of South Carolina. Award of these grants will be in conjunction with participation in one of the established loan programs with which the University is affiliated.

Western Electric Fund Scholarships. Two awards are available annually for freshmen who enroll in Electrical, or Mechanical

Engineering, and associated fields. May be renewed if satisfactory progress is made.

SCHOLARSHIPS FOR UPPERCLASSMEN

Recipients of the following awards are normally selected by the scholarship committees in early spring for the following school year. Completed applications must be submitted not later than March 1, to insure consideration. (Also note that some few freshman scholarships are equally available for upperclassmen.)

Jerry B. Addy Memorial Scholarship. Income from a fund donated by his relatives and friends provides a renewable annual award to a rising junior majoring in Mathematics, Physics, or Chemistry. Priority is given to residents of South Carolina. Selection is based upon academic proficiency and financial need.

Allied Chemical Foundation Scholarships. Two $750 awards are given annually to upperclassmen majoring in a Textile curriculum.

Alumni Debate Scholarship. A grant from the Alumni Loyalty Fund makes possible a scholarship of $200 for a rising sophomore member of the Calhoun Forensic Society who has demonstrated excellence in debating as a freshman and whose general scholarship is superior.

G. Dewey Arndt Scholarship. Income from a fund established by FCX, Inc., and Carolina Cotton Growers Association, Inc., provides $500 for one or more awards to outstanding students in the College of Agriculture and Biological Sciences, with preference given to students with an indicated interest in marketing and economics.

Barney Lee Bickley Memorial Scholarship. Income from a fund donated by his relatives provides an annual award for a sophomore student. Priority is given to residents of South Carolina.

Borden Agricultural Scholarship. A $300 award is made annually to the rising senior in the College of Agriculture and Biological Sciences who has achieved the highest scholastic average on all college work prior to the senior year.

Burlington Industries Foundation Scholarship. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually to a rising junior. Selection is based upon leadership, scholarship, and financial need. Preference will be given to students majoring in Textile or Industrial Management.

The Carolina Yarn Association Scholarship. A $500 scholarship is awarded annually to an upperclassman majoring in Textiles.

The A. B. Carter, Incorporated, Scholarship. A $500 scholarship is awarded annually to an upperclassman majoring in Textiles.

Chemstrand Scholarship. A $500 award is available annually to a rising junior majoring in Textiles or Textile Chemistry and planning a career in industry. Selection is based upon scholarship, financial need, and extracurricular activity.

Langdon Cheves Scholarship. Income from a fund donated by his family provides an annual $400 award for a male undergraduate whose permanent place of residence is within the Southeastern United States. Selection is based upon academic progress, financial need, and participation in extracurricular activities.

Coburg Dairy Scholarship. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually to a junior majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Gilbert H. Collins Memorial Scholarship. A $600 award, given by the South Carolina Plant Food Educational Society, to be paid in equal installments during the last two years of satisfactory undergraduate study is available each year to a rising junior majoring in the Department of Agronomy and Soils. Selection is based upon scholarship, leadership, character, and financial need.

Cotton Producers Association Scholarship. A $900 award, to be paid in three equal installments during the sophomore, junior, and senior years, is available annually to a rising sophomore majoring in Agricultural Economics, Agricultural Education, Agricultural Engineering, Agronomy—Crops and Soils, Animal Science, Dairy Science, Entomology, Food Science, Horticulture (Fruit and Vegetable), or Poultry Science. Selection is based upon scholarship, leadership, character, and financial need.

Ethyl Corporation Scholarhip. A $500 award is available annually for a student majoring in Chemical Engineering. Selection is based upon scholastic ability and financial need.

Farm Credit Banks of Columbia Scholarships. Two $500 awards are available for juniors or seniors enrolled in the Agricultural Economics major or minor, the Business minor in any other agricultural major, or any equivalent undergraduate program in agriculture. Renewal subject to academic achievement. Selection based upon scholarship, leadership, character, and financial need.

Fieldcrest Scholarships. Fieldcrest Mills makes available annual scholarships (and, if desired, summer employment) to upperclassmen enrolled in specific curriculums pertinent to employment in the textile industry. Selection is based upon academic excellence, extracurricular activities, financial need, and willingness to consider a textile career.

W. T. Fort, Sr., Scholarship. A $500 award is available to rising seniors in Architecture or Building Construction. Selection is based primarily upon financial need.

Foundry Educational Foundation Scholarships. Funds made available by grants from the Foundation provide one or more annual awards to students taking organized programs applicable to the casting of metals and foundry technology.

Ben H. Gardner Fund. Income from a fund donated to the University is awarded annually to a worthy student in the College of Engineering.

Ben and Kitty Gossett Scholarship. Income from their contribution provides one or more annual awards for Textile students whose families are employed by the textile industry in South Carolina.

J. H. Griffin Memorial Scholarship. Income from the J. H. Griffin Memorial Scholarship fund provides an annual award for a rising male senior (legal resident of South Carolina) majoring in Animal Science. Selection is based upon scholarship, leadership, character, and financial need.

Pauline Hanckel Dairy Scholarship. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is provided annually by the Ladies Auxiliary of the South Carolina Dairy Association to be available to a junior majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Higgins Undergraduate Scholarships. Income from a fund donated by Mr. Higgins provides several annual awards for undergraduate students enrolled in the College of Engineering. Selection is based upon scholarship and need.

Richard O. Hull Scholarships. Two $500 awards are available annually for students majoring in Chemistry and Chemical Engineering who have achieved superior scholastic averages on all their college work. Selection is based primarily upon academic ability although financial need will also be taken into cognizance.

John D. Lane Scholarship. A $200 award is available each year to a rising junior. Selection is based upon financial need and scholastic ability, with emphasis upon achievement in the field of English.

Minnesota Mining & Manufacturing Company Scholarships. Two $500 scholarships are awarded annually to students majoring in Chemical Engineering. Selection is based upon academic standing, character, and demonstrated leadership abilities.

Monsanto Scholarship. A $500 award is available annually for a student majoring in Chemical Engineering.

Owens-Corning Fiberglas Scholarships. Two $500 awards (one in Ceramics) are available annually to rising juniors or seniors. Selection is based upon academic ability, leadership qualities, and financial need.

Peace Fund Scholarship. A $500 award is available annually to a rising junior or senior. Selection is based upon journalistic ability, scholastic achievement, and evidence of good character.

Pennsylvania Glass Sand Scholarship. A tuition award is given annually to an outstanding rising senior majoring in Ceramic Engineering. Selection is based upon scholastic achievement.

Ralston Purina Scholarship. A $500 award is given annually to a rising senior enrolled in the College of Agriculture and Biological Sciences. Selection is based upon scholarship, leadership, character, extracurricular activities, sincerity of purpose in agriculture, and financial need.

Rayonier Scholarship. A $500 award is available annually for a rising senior majoring in Engineering. Selection is based upon academic standing and leadership ability.

J. C. Rich ('13) Agriculture Scholarship. Income from a fund donated by his sister provides an annual award for a deserving male undergraduate enrolled in the College of Agriculture and Biological Sciences. Preference is given relatives.

Seydel-Woolley & Company Scholarship. A $500 award is available annually to a rising junior or senior male student majoring in Textiles. Selection is based upon scholastic ability, evidence of leadership, potential to the Southern textile industry, and financial need.

The J. E. Sirrine Company Scholarship. A $500 scholarship is awarded to an outstanding undergraduate student in Civil Engineering, Chemical Engineering, Electrical Engineering, or Mechanical Engineering. This award is based upon a consideration of character, scholarship, and interest in a particular professional field. Preference is given to rising sophomores. Financial need is not a specific requirement.

Sonoco Products Scholarships. Two $500 awards are available annually for deserving undergraduates majoring in Textiles.

South Carolina Dairy Association Scholarships. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually to a junior from South Carolina majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Charles H. Stone Scholarship. A $1,000 award is available annually to a rising sophomore. Selection is based primarily upon exceptional academic achievement plus financial need.

Uni-Royal Foundation Scholarship. A $700 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually to a rising junior planning a career in industry. Selection is based upon proven scholastic ability and financial need.

J. P. Williamson Memorial Grants. Income from a fund donated by his relatives and the Winn-Dixie Stores Foundation is available annually for renewable grants to academically qualified and needy upperclassmen. Grants must be matched by loans from one of the established programs with which the University is affiliated. Priority is given to residents of Anderson County.

LOAN FUNDS

General prerequisites for the following aid are enrollment, or acceptance for enrollment, as a full-time student, substantiated need, and adequate academic capability or potential to maintain at least average college-level grades. Applicants for other types of financial assistance may also be considered for loans after contacting the Financial Aid Office. Availability is dependent upon adequacy of funds at hand. Normal cutoff date for loan applications is June 1.

Georginanna Camp Foundation Fund. A fund, donated in memory of Georgianna Camp by her husband and sons, is available to assist worthy students who are seeking a college education and need assistance to supplement their individual efforts and available sources of income.

Clemson Architectural Foundation. Needy Architecture students in the upper years of their curriculum who show professional promise will be considered for loans from the General Fund of the Foundation.

Clemson Student Loans. A number of interested faculty and staff members, alumni, students, families, and friends have made memorial donations to assist worthy students.

Clemson University Foundation. A limited sum is available for emergency student loans. Included are donations from family and friends made in memory of J. C. Littlejohn ('08), J. H. Woodward, Jr. ('35), and his father, Uncle Jake ('02).

Daniel Memorial Fund. Income from a sum donated by officers of the Daniel Corporation in memory of James Fleming Daniel and Fred Adams Daniel is loaned to deserving students.

Federal Nursing Loan Program. Funds are available to provide loan assistance to Nursing students (either baccalaureate or associate degree programs). Prerequisites are verified need and the demonstrated ability or potential to maintain normal and satisfactory academic progress.

National Defense Student Loan Program. State and Federal monies are available to provide assistance to graduate and undergraduate students. Prerequisites are verified need and the demonstrated ability or potential to maintain normal and satisfactory academic progress.

Reid-Baskin Fund. Income from a fund donated in memory of Cecil L. Reid ('02) and John Baskin will be used to aid deserving students. Preference is given Newberry and York County residents.

Tile Council of America Fund. The Tile Council has made a grant to be used for interest-free loans to outstanding and needy students in the lower years of the Architecture curriculum.

United Student Aid Funds Loan Program. Clemson University is one of a large number of universities participating in this national nonprofit loan program for needy and deserving students. Full-time students may borrow up to $1,500 per year. Payment of interest and principal normally begins the tenth month after graduation and may be anticipated. The financial aid officer recommends the loan, after consultation with the student, and the loan is negotiated at the student's home town bank on the student's own signature. This is the designated lending agency of the State of South Carolina. Under the provisions of the Higher Education Act of 1965, and depending upon family income, the U. S. Commissioner of Education may pay the interest on eligible loans while the student is in school.

STUDENT PART-TIME EMPLOYMENT

Clemson University employs students in those positions where part-time services may be utilized to mutual employment advantage. Students in actual need of financial aid are usually given preference in filling positions, all other qualifications being equal. Part-time employment of first-year students is not encouraged as the University has found through long experience that the period of academic adjustment during the freshman year allows little time for such extracurricular activity. The Student Financial Aid Office maintains application files of students desiring part-time employment for the information of requesting academic departments and off-campus agencies and industries interested in securing such help. Applications must be filed after registration for each semester during which part-time work is desired. Clemson does not participate in the Federal College Work Study Program.

OTHER SOURCES OF FINANCIAL AID

The following types of assistance are not administered by Clemson University. Recipients will be required to furnish the supporting agencies with a schedule of payments due the Bursar if payment is desired to be made through the University. Such funds must be received by him on or before the due dates. Any other arrangements require approval of the Bursar.

National and State Agencies. Students should investigate such sources of financial aid as the following: Veterans Education, War Orphans Education, advanced ROTC programs, National Guard and Reserve training programs, National Merit Scholarships, American Legion free tuition for deceased or totally disabled veterans' children, and grants made to the handicapped through the State Department of Vocational Rehabilitation.

Other Agencies. Help is often received from grants or loans through Beta, FFA, and 4-H Club membership; local organizations of the Daughters of the American Revolution, United Daughters of the Confederacy, Civitan, Elks, Masonic, Rotary and similar groups; James F. Byrnes Foundation, Pickett and Hatcher Educational Fund, Methodist Student Loan Foundation, Knights Templar Educational Foundation, The Agricultural Society of South Carolina, The Garden Club of South Carolina, South Carolina Agricultural Teachers Association, Institute of Food Technologists, South Carolina Nurserymen's Association; Wallace Hatchery, Inc., and various other religious, civic, welfare, and educational agencies.

Industry and Related Foundation Support. Students are often able to finance part of their education by summer employment or by alternating semesters between the University and jobs with establishments near their homes. Some students are eligible for loans or grants which are administered by those corporate and local industries which employ their parents. The finest source of information regarding this type of support has been found to be high school counselors.

Miscellaneous. There are available a number of "deferred tuition" lending plans. Examples of these are Education Funds, Inc., Tuition Plan and College Aid Plan.

It should be realized that the University has no affiliation or contractual agreement with any of the agencies sponsoring such plans and can accept no responsibility for the outcome of any individual arrangements entered into with those agencies.

The Army Student Nurse Program may provide financial assistance from the U. S. Army for the last 24 months of the baccalaureate program. The allotment provides for basic pay, lodging, food allowance, tuition, books, and incidental fees, free medical and dental care and other privileges. Applicants must be in good standing. Apply through the Dean of the School of Nursing.

HONORS AND AWARDS

Recipients for the following awards are chosen for their special achievements by selection committees, and are announced at an annual Honors and Awards Day program in the spring or at other appropriate ceremonies during the year.

Air Force Association Award. The Air Force Association of Washington, D. C., awards this medal annually to the outstanding Aerospace Studies 400 cadet who has shown outstanding aptitude for both academic and military pursuits.

Air Force Times Award. Presented annually to one graduating cadet at each detachment who has distinguished himself in bringing constructive attention to the Air Force ROTC.

Daughters of the American Revolution Award. Presented annually to an outstanding Aerospace Studies 400 cadet.

The Alpha Rho Chi Medal. The Alpha Rho Chi fraternity annually awards a gold medal to the graduate of the professional curriculum in Architecture who has shown the greatest leadership, service to his school, and who gives promise of professional merit.

Alpha Tau Alpha Scholarship Medal. An annual award is given to the senior in Agricultural Education having the highest scholastic record.

Alpha Zeta Award. An annual award is given to a major in the College of Agriculture and Biological Sciences having a high scholastic record and possessing qualities of character and leadership.

Ambrosia Chocolate Award. An engraved watch is given annually by the Ambrosia Chocolate Company to the senior in Dairy Science having the highest grade in Dy Sc 304.

American Agricultural Economics Association Award. This award is presented each year by the Clemson Student Chapter of the American Agricultural Economics Association to the outstanding student in Agricultural Economics, based on academic attainment and leadership in the club and other extracurricular activities.

American Association of Textile Chemists and Colorists Award. An annual award is given for the best work done in Textile Chemistry and Dyeing by a member of the graduating class.

American Association of Textile Technologists Award. An annual award is given to the graduate having a high scholastic record and all-round qualification for success in the textile industry.

American Association of University Women Award. The Clemson branch awards an engraved silver bowl annually to the girl graduating with the highest cumulative grade-point ratio.

American Chemical Society Award. An annual award is given to the outstanding senior in Chemistry who is a member of the student affiliate chapter of the American Chemical Society.

South Carolina Chapter, American Institute of Architects Award. The South Carolina Chapter of the American Institute of Architects each year awards a Certificate of Merit to the outstanding fourth-year student of Architecture in the Design Option and the Structural Option.

American Institute of Architects Medal. The National Organization of The American Institute of Architects awards each year a silver medal and a book to the outstanding graduate in the professional curriculum in Architecture at Clemson. An award is also presented to the runner-up.

American Institute of Chemical Engineers Award. The American Institute of Chemical Engineers sponsors an annual award to the junior majoring in Chemical Engineering who has attained the highest scholastic standing through the sophomore year.

Institute of Electrical and Electronics Engineers Scholastic Award. An annual award is given for outstanding participation in the Student Branch activities of IEEE to a second-semester junior or the first-semester senior having high scholastic standing.

American Legion ROTC General Military Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Air Force ROTC cadet who has demonstrated outstanding qualities in military leadership, discipline, character and citizenship.

American Legion ROTC General Military Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Army ROTC cadet who has demonstrated outstanding qualities in military leadership, discipline, character and citizenship.

American Legion Scholastic Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Air Force ROTC cadet based on scholastic achievement.

American Legion Scholastic Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Army ROTC cadet based on scholastic achievement, participation in student activities and demonstrated leadership.

American Society of Agronomy Award. The American Society of Agronomy sponsors an annual award to an outstanding senior in the Department of Agronomy and Soils.

American Society of Civil Engineers Membership Award. The South Carolina Section of the American Society of Civil Engineers sponsors an annual award to the outstanding graduating senior in Civil Engineering.

The American Society of Mechanical Engineers Award. An annual award is given to a senior in Mechanical Engineering for his outstanding service in the College of Engineering.

Society of American Military Engineers Award. The Society of American Military Engineers awards annually a gold medal with key replica to the twenty outstanding AFROTC cadet juniors and to the twenty outstanding AFROTC cadet seniors enrolled in Aerospace Studies in colleges and universities throughout the nation who are majoring in Engineering.

Society of American Military Engineers Award. The Society of American Military Engineers awards annually a gold medal with key replica to the twenty outstanding Army ROTC cadet juniors and to the twenty outstanding Army ROTC cadet seniors enrolled in the Army General Military Science ROTC Units in colleges and universites throughout the nation who are majoring in Engineering.

Major Rudolf Anderson, Jr., Trophy. The trophy is presented annually to the Aerospace Studies cadet who has distinguished himself by his performance and dedication to the precepts of the AFROTC Cadet Wing at Clemson University, such actions having been acknowledged to constitute the most outstanding contribution to the promotion and enhancement of the traditions, ideals, and aspirations of the Air Force Reserve Officer's Training Corps.

Architectural Faculty Award. The faculty of the College of Architecture has established this award for recognition of academic excellence of a first-year pre-architecture student.

Armed Forces Communication and Electronics Association Gold Medal. The Armed Forces Communications and Electronics Association of Washington, D. C., sponsors an annual award to the outstanding senior Army ROTC cadet majoring in Electrical Engineering.

The Armed Forces Communication and Electronics Association Award. An annual award is given to the outstanding AFROTC senior majoring in Electrical Engineering who has demonstrated outstanding qualities of military leadership, character, and definite aptitude for military service.

South Carolina Chapter, Armed Forces Communications and Electronics Association Leadership Award. A $25 Savings Bond is awarded annually to an outstanding ROTC junior majoring in Electrical, Electronics, or Communications Engineering.

Associated Schools of Construction Award. A book is given in the name of the Associated Schools of Construction to a student in Building Construction for scholarship and for his having demonstrated promise of future achievement in his chosen field.

Association of the United States Army Award for Excellence in Military History. The Association of the United States Army annually sponsors an award to the second-year Army ROTC cadet achieving the highest average in Military History.

Association of the United States Army ROTC Award. The Association of the United States Army annually awards a medal to each of four junior ROTC cadets who are in the top 10 per cent in ROTC grades and in the top 25 per cent in general academic grades and who have contributed most, through leadership, to advancing the standing of the Army ROTC unit and the Military Science Department at Clemson University.

G. H. Aull Essay Award. A $25 award is given annually to the senior student presenting the best essay in the field of Agricultural Economics.

Block and Bridle Club Scholarship. A $100 award to be paid at the beginning of each regular semester is available to a junior in the Block and Bridle Club. Selection is based on scholastic ability, financial need and leadership in the club and other activities.

Chemistry Faculty Award. An annual award is given to the sophomore majoring in Chemistry who maintained the highest scholastic record in Chemistry during his first two semesters of work.

Class of 1902 Awards. The members of the Class of 1902 have deposited with the Clemson University Foundation three funds of $2,000 each, in recognition of the distinguished teaching services of three professors who were on the faculty at that time, and in memory of those of the class who have passed on. The income from these funds is to be awarded annually as follows: *The Williston Wightman Klugh Award,* to a worthy, earnest undergraduate student of good moral code and personality who intends to make teaching his life work; *The Rudolph Edward Lee Award,* to a worthy undergraduate student in Architecture, upon the recommendation of the faculty of that College after consideration of the student's grades, extracurricular activities, and those qualities that go toward making a successful professional architect; and *The Samuel Maner Martin Award,* to a worthy undergraduate student taking mathematics as a major subject.

Commander's Saber. Presented annually by the Professor of Military Science to the Army ROTC cadet officer considered to have contributed most to the advancement of the cadet brigade through leadership and devotion to duty.

Howard Carlisle Copeland Memorial Award. The family of Howard Carlisle Copeland, who gave his life during World War II, has set up a permanent memorial fund in his memory. Each year the interest from the fund shall be given to the boy who has made the greatest endeavor financially to stay in college.

The H. William Close Achievement Award of the Textile Veterans Association. A medallion and a $100 U. S. Savings Bond is awarded annually to the most outstanding senior in either the Textile Chemistry or Textile curriculum in honor of Mr. H. William Close, President of Springs Mills, Incorporated.

The Marvin R. Cross Honor Award of the Textile Veterans Association. A $50 U. S. Savings Bond and a medallion is awarded annually to an outstanding senior in the Textile Department of the College of Industrial Management and Textile Science.

Danforth Fellowships. The Danforth Foundation of St. Louis awards two fellowships each year to agricultural students. One of these is given to an outstanding member of the junior class majoring in either Agricultural Economics, Agricultural Education, Animal Science, Dairy Science or Poultry Science, and provides for a 2-week summer short course with Ralston Purina Company, and a 2-week stay at the American Youth Foundation Leadership Training Camp at Shelby, Michigan. The second award provides for a 2-week stay at the Leadership Camp at Shelby, Michigan, and is awarded to an outstanding freshman in the College of Agriculture and Biological Sciences.

Distinguished Military Student Badge. An annual award is given by the Department of the Army to those individuals, designated by the Professor of Military Science, who possess outstanding qualities of leadership, high moral character, and definite aptitude for Army service. They must have attained an academic standing in the upper half of their class and demonstrated leadership ability through their achievements while participating in recognized campus activities. Such recognition carries with it the opportunity for commissioning in the Regular Army.

Samuel B. Earle Award. An award established by Clemson Alumni in honor of Dean Samuel B. Earle, who ended 48 years of service to Clemson University in July, 1950, is given annually to an outstanding senior in the College of Engineering.

Lena Brayton Eaton—Carrie Hutchins Freeman Award. An annual award made by the Department of Music to an undergraduate of Clemson University who is the winner of a competition consisting of the performance on the piano of a composition of serious music. The award honors two persons who contributed greatly to a deeper appreciation of music in the Clemson community and in the University where their husbands were members of the faculty.

Dr. R. C. Edwards Award. Awarded annually to the outstanding Clemson University Army ROTC cadet who attained the highest degree of proficiency during the preceding ROTC summer camp.

English Honor Key. This key is awarded annually to a student in the graduating class who has an outstanding record in English as an undergraduate at the University.

South Carolina Entomological Society Award. An annual award is given to an undergraduate student majoring in Entomology. Selection will be made on the basis of scholarship and character.

The Faculty Award of the College of Industrial Management and Textile Science. A gold medallion and a U. S. Savings Bond is awarded annually to the most outstanding graduating senior in the College.

Faculty Scholarship Award. An annual award is given to the member of the graduating class with the highest academic achievement by the academic faculty. The winner receives a certificate and a gold medal and has his name inscribed upon a plaque which is placed in the main entrance of Tillman Hall. This plaque carries the names of all previous winners of the award.

Forbes Chocolate Award. A $100 award is available annually to a sophomore majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Forestry Award. The income from a fund donated to the University is presented annually to the senior in Forestry with the highest academic record.

Forestry Junior Scholar Award. An award of $50 is presented to the junior in Forestry having the highest academic record. The award is made possible by contributions from certain wood-using industries and from the South Carolina Society of Consulting Foresters.

Gamma Sigma Delta Awards. Awarded annually to the student in the sophomore class and in the senior class majoring in Agriculture and having the highest scholastic attainment.

Ben H. Gardener Award. The income from a fund donated to the University by the father and son is given annually to some worthy and needy student in the College of Engineering.

General Dynamics Award. An annual award is given to the most outstanding sophomore student of the basic AFROTC course who is qualified and motivated for an Air Force career.

J. H. Griffin Memorial Scholarship. Income from the J. H. Griffin Memorial Scholarship Fund provides for an annual award to a rising male senior (legal resident of South Carolina) majoring in Animal Science. Selection is based upon scholarship, leadership, character, and financial need.

Industrial Management Merit Award. An award is provided by the Neely and Gibson Coal Sales Company (William J. Neely, '32, and Harry H. Gibson, '32) for an Industrial Management major who has demonstrated through outstanding academic performance and excellent personal characteristics sufficient potential to enable him to assume significant managerial responsibilities in modern industry.

Harrison Freeman Lathrop Award for Scholarship. An award in honor of Mr. Harrison Freeman Lathrop, an outstanding forester of South Carolina, provided by the South Carolina Tree Farm Committee and by Mr. Oswald Lightsey, of Hampton. The award, consisting of $100 and an engraved plaque, is given to a Forestry senior selected by the faculty of the Department of Forestry on the basis of scholarship, leadership, and personality.

Rudolph E. Lee Award. In recognition of the distinguished teaching service of Rudolph Edward Lee and in memory of those of the class who have passed on, the members of the Class of 1902 present each year the Rudolph Edward Lee Award of $100 to a worthy undergraduate student in Architecture, after consideration of his grades, extracurricular activities, and those qualities that go toward making a successful professional architect.

James Lynah Merit Awards. Income for several awards is derived from a fund established by Mr. James Lynah, in memory of distinguished professors who were teaching at Clemson when the Class of 1902 were undergraduates, as follows: *The Charles Manning Furman Prize* in English, *The Mark Bernard Hardin Prize* in Chemistry, *The William Shannon Morrison Prize* in History, *The Charles Carter Newman Prize* in Horticulture, *The Walter Merritt Riggs Prize* in Electrical Engineering and *The Augustus G. Shanklin Prizes* in ROTC, Air and Military Science and Tactics. These awards are made to students having a high scholastic rating and possessing outstanding qualities of character and leadership.

Clark Lindsay McCaslan Award. A sum of money has been deposited with the University to establish a fund in memory of Clark Lindsay McCaslan, Class of 1908, and a pioneer in Agricultural Engineering. The income from the fund shall be given annually to the student in the Department of Agricultural Engineering who in the opinion of the faculty shall be deemed to be the most deserving.

Colonel S. T. McDowell Award. Awarded annually to the outstanding Army ROTC cadet senior scheduled to be commissioned in a Combat Arm of the United States Army.

Henry T. Malone Gamma Alpha Mu Award. Henry T. Malone, Class of 1937, will present a $50 award to the undergraduate student who writes the best feature on campus, community, or state history to appear in *The Tiger.*

Marksmanship Awards. Medals are annually presented to those members of the Army ROTC Rifle Team achieving highest position average scores.

Dr. Ralph Mershon Memorial Award. The Secretary of the Army will present annually a $250 prize to the outstanding Distinguished Military Graduate of a senior division Army ROTC university or college who is commissioned in the Regular Army.

National Defense Transportation Association Award. This award may be presented annually to an outstanding Aerospace Studies 400 cadet majoring in Industrial Management.

Northern Textile Association Honor Award. A medallion is awarded annually to the graduating senior in the Textile curriculum with the highest scholastic average in the Textile curriculum.

National Defense Transportation Association Award. The National Defense Transportation Association will award annually the NDTA Medal to the twenty outstanding senior students enrolled in General Military Science Army ROTC units throughout the nation.

Thomas Newcomen Award in Material History. The Newcomen Society in North America gives an annual award for the best research paper presented in the field of Material History.

Norris Medal. The following is from the will of the Hon. D. K. Norris, a life trustee of Clemson, who died in 1905:

"I give $500.00 face value, Norris Cotton Mill stock . . . on condition the dividend thereon shall be applied annually to the purchase of a gold medal, to be known as the 'Norris Medal,' to be awarded to the student of Clemson meriting the same at graduation, under such rules and conditions as may be prescribed by the said Board of Trustees, and which medal shall have engraved on it '*Honor habet onus*' (Honor brings responsibility)."

The winner of the Norris Medal has his name inscribed upon a plaque which is placed in the main entrance of Tillman Hall. This plaque carries the names of all previous winners of the Norris Medal since it was first awarded in 1908.

American Ordnance Association Gold Scholarship Key. The American Ordnance Association, Washington, D. C., sponsors annually an award to the senior Army ROTC cadet with the most ability in the ordnance field to be commissioned to the Ordnance Corps.

Outstanding Cadet Non-Commissioned Officer Award. An annual award of the Department of Military Science presented to the Outstanding Army ROTC Cadet NCO based on exhibited improvement in all aspects of military performance.

Willie N. and Joe Wise Padget Scholarship. The income from a fund donated to the University by members of their family is used annually to aid a deserving student from Saluda County.

Phi Eta Sigma Mathematics Award. An annual award is given to a freshman scoring highest on a competitive examination in mathematics.

Phi Eta Sigma Scholarship Medal. An annual award is given to the senior having the highest scholastic record.

Phi Kappa Phi Award. An annual award is given to the junior having the highest scholastic record.

Phi Psi Award. This award is made annually by the National Honor Council of the Phi Psi Textile Fraternity to an outstanding graduating senior in either the Textile Chemistry or Textile curriculum, considering scholastic record, leadership ability, and other qualities.

Physics Faculty Awards. An annual award of $50 is given to the outstanding sophomore majoring in Physics, and an annual award of $100 is given to the outstanding junior majoring in Physics.

Piedmont Engineers and Architects Award. An annual cash award to the sophomore majoring in Civil Engineering who has the highest scholastic record during his first three semesters of work.

Pomona Pipe Products Award. A cash award is made to the member of the junior class in Civil Engineering with the most outstanding academic record.

Quartermaster Association Awards. The Quartermaster Association annually awards a medal to the ten outstanding junior students and a scholastic key to the ten outstanding senior students enrolled in the Army General Military Science ROTC program in colleges and universities throughout the nation. Students must be enrolled in courses including as a major item of curriculum at least one educational area of particular interest to the Quartermaster Corps.

Reserve Officers Association Award. Awarded annually to an AFROTC sophomore, junior, and senior cadet, based on scholastic and Aerospace Studies grades, and leadership qualities.

Reserve Officers Association Medal. The South Carolina Department of the Reserve Officers Association sponsors an annual award to the outstanding Army ROTC Cadet in each of the four academic years.

The Harry Riemer Honor Award of the Textile Veterans Association. A medallion and a $25 U. S. Savings Bond is awarded to a member of the graduating class who has the potential to make an outstanding contribution to the textile industry in future years.

Sigma Pi Sigma Award. An annual award is given to the outstanding senior in the Physics Department.

Sigma Tau Epsilon Award. An annual award is given to the senior majoring in the College of Liberal Arts or the College of Physical and Mathematical Sciences and having the highest scholastic record.

R. W. Simpson Medal. A medal designated as the "R. W. Simpson Medal" is awarded annually to the best drilled Army ROTC cadet in each of the freshman, sophomore, or junior classes.

The Solite Award. The Southern Lightweight Aggregate Company annually makes a grant of $1,000 to the Clemson Architectural Foundation, a portion of which is used for prizes for those fifth-year professional theses adjudged to be outstanding.

Sons of the American Revolution Medal. An annual award is given to a freshman AFROTC cadet who is outstanding in academic courses, Aerospace Studies, and leadership characteristics.

The South Carolina Masonry Association Award. The South Carolina Masonry Association annually makes a grant of $600 to the Clemson Architectural Foundation, a portion of which is used for awards in an intermediate-level architectural design problem.

South Carolina Society of Sons of American Revolution Medal. An annual award is given to an Army ROTC cadet who exhibits a high degree of merit with respect to leadership, soldierly bearing and excellence in theoretical courses of study.

The Southern Brick and Tile Award. The Southern Brick and Tile Association annually makes a grant of $100 for prizes awarded in an advanced-level architectural design problem.

Algernon Sydney Sullivan Medallion. A valuable and artistic memorial, established by the Southern Society of New York in honor of its first president, is awarded each year by the University to a member of the graduating class and to one other person who has some interest in, association with, or relation to the institution, official or otherwise, of a nature as to make this form of recognition appropriate. The recipients of this award shall be chosen in recognition of their influence for good, their excellence in maintaining high ideals of living, their spiritual qualities, and their generous and disinterested service to others.

Superior Cadet Ribbon Awards. The Department of the Army awards annually Superior Cadet Ribbons to those Army ROTC students in each academic year (class) adjudged the most outstanding in their class.

Third Army Certificate of Meritorious Leadership Achievement. An award is given annually by the Commanding General of Third Army to the outstanding cadet on the basis of leadership development throughout the ROTC career.

Tau Beta Pi Scholastic Award. An annual award is given to the sophomore in Engineering having the highest scholastic record.

Trustees' Medal. The Board of Trustees has provided for a gold medal to be awarded annually to the best speaker in the student body.

Virginia Dare Award. An award of $25 is given annually by the Virginia Dare Extract Company, Incorporated, to the senior majoring in Dairy Science and having the highest grade in Dy Sc 402, Dairy Manufactures.

Wall Street Journal Student Achievement Awards. These annual awards are given to the most outstanding senior with a concentration in Agricultural Economics, College of Agriculture and Biological Sciences, and Economics, in the College of Industrial Management and Textile Science.

Wyandotte Award. The Wyandotte Chemicals Corporation Trophy is awarded to the senior in Dairy Science having the highest grades in Dy Sc 409 and 410.

GUIDANCE SERVICES

Guidance has an important role at all levels of education and particularly so during times of transition and articulation. To assist students in this period of emotional and academic adjustment, an orientation and counseling program has been established.

At the beginning of his university career, each student is assigned to a faculty adviser selected from his academic school. The faculty advisers provide information on courses of study, approve class schedules, interpret academic regulations, and suggest adjustments in making satisfactory progress toward graduation.

The residence hall program is organized to cope with personal problems and questions regarding procedures and policies of college life. Residence hall counselors and supervisors are primarily concerned with maintaining an environment compatible to serious study and with the educational potential of group living.

COUNSELING SERVICES

Counseling Services are located in Tillman Hall. These services are available free of charge to all registered students and spouses of registered students. These services are oriented to early identification of and assistance with academic, vocational, personal, and psychological problems. Testing facilities of a vocational and psychological nature are available. Students are encouraged to take advantage of the individual services of a Counseling Psychologist, a Counselor, and of the Psychometric Services.

The service is dedicated to helping students in self-understanding, self-improvement, and in the attaining of academic and vocational goals. The aims of the service and preventive rather than curative.

PLACEMENT SERVICES

The University is glad to assist all who ask for help in securing summer or permanent employment; it does not assure positions for those who complete any of the courses of study.

The Placement Office coordinates and plans campus interview visits requested by representatives seeking graduates for positions with business, industry, and public service. It maintains current files of reported job opportunities and of alumni who wish to learn of available openings.

A Placement Bulletin is prepared periodically for distribution on the campus and for mailing to alumni upon request. It announces scheduled campus interviews and lists specific openings which may be of interest to students and alumni.

BUILDINGS AND GROUNDS

Today, as throughout Clemson's history, the focal point of this picturesque campus is the Tillman Hall clock tower, the symbol of scientific education, research, and public service in South Carolina. Honoring the memory of colorful Governor "Pitchfork Ben" Tillman, this building houses administrative offices on the two lower levels and classrooms upstairs.

The Clemson campus consists of 600 acres and represents an investment of approximately $60 million in academic buildings, student housing, service facilities, and equipment. Basically, this is the plantation that Thomas Green Clemson willed to South Carolina for the establishment of the University. Fort Hill, the former home of both Mr. Clemson and his father-in-law, John C. Calhoun, is preserved in the center of the campus as a national shrine.

Beyond the main campus, stretching into Oconee, Pickens, and Anderson Counties, are another 23,000 acres of farm and agricultural and engineering research lands. Located throughout the State are 6,800 more acres devoted to Agricultural Experiment Station research and 4-H Club work.

The university's $60 million building program to meet the projected needs of a 10,000 student body by 1975 is over 25 per cent complete, with $16 million in new construction enhancing the campus skyline.

The central feature of campus development, the Robert Muldrow Cooper Library, was completed in 1966. This beautiful structure houses approximately 400,000 volumes, and is the permanent home of papers and souvenirs belonging to the Honorable James F. Byrnes.

Other new facilities completed under the current building program are two high-rise residence halls which currently house 864 students, a 34-bed hospital and out-patient clinic, an additional cafeteria, an arts and sciences classroom building and 10-story faculty office tower, a graduate engineering research building, and the J. C. Littlejohn Coliseum which seats 10,500 people for basketball games and 12,000 people for speaking engagements, concerts, and other functions.

Teaching and laboratory facilities of the College of Agriculture and Biological Sciences are housed in the several buildings of the R. F. Poole Agricultural Center. Another grouping serves the College of Engineering. Among these are Olin Hall for Ceramic Engineering and Earle Hall for Chemical Engineering. These two buildings and the excellent equipment they house represent gifts from the Olin Foundation totaling nearly two million dollars.

Sirrine Hall is the home of the College of Industrial Management and Textile Science and within it are located government and industrial cotton fiber testing laboratories. The College of Architecture is located in a modern, well-equipped building and other groupings of classrooms and laboratories serve the College of Education, the College of Liberal Arts, the College of Physical and Mathematical Sciences, and the School of Nursing.

The 15 residence halls for men and women accommodate nearly 5,000 students. Individual units or apartments provide living accommodations for another 289 married students.

The university-owned Clemson House Hotel and 112 faculty and staff housing units provide excellent community hotel facilities and permanent housing.

RESERVE OFFICERS' TRAINING CORPS (ROTC)

The Department of the Army and the Department of the Air Force both maintain ROTC units at Clemson University. The mission of the Reserve Officers' Training Corps is to produce officers having qualities of leadership and attributes essential to their progress and continued development as commissioned officers in either the Army or the Air Force of the United States. A four-year program, consisting of the basic course for freshmen and sophomores and the advanced courses for juniors and seniors, is offered by both services.

To enroll in basic ROTC, students must be at least 14 years of age and citizens of the United States at the time of entrance. They must be of good moral character and must sign a loyalty certificate. They must not be physically disqualified to the extent that drill would further aggravate the physical defect. Air Force candidates will be administered a written Air Force Officer Qualification Test and a physical examination during their freshman or sophomore year to determine eligibility for the advanced AFROTC course, and interested Army candidates will be administered a written Army Officer Qualification Test and a physical examination during their sophomore year to determine eligibility for advanced Army ROTC. Foreign students may enroll in the ROTC program provided they sign a statement of intention to become American citizens or receive the approval of their government.

A maximum enrollment restriction is placed on entrance into the advanced ROTC program. Students enrolled in the advanced course are paid $50 per month, including one summer vacation. Pay while attending summer camp is computed differently and is considerably higher. Members of the advanced course are required to attend one summer camp before commissioning.

Students who have six months or more active military service and students who have successfully completed two or more years of ROTC training at the high school level may substitute such service and preparatory schooling for all or part of the Clemson basic ROTC course. Students in either of these categories should consult with the Head of the Military Science or Aerospace Studies Department concerning accreditation.

Students who complete the prescribed ROTC courses and receive a bachelor's degree may be awarded commissions in either Regular or Reserve components of the Army or Air Force. Students who complete the basic course may receive 4 semester credit hours of elective credit; those selected for Advanced ROTC may substitute Aerospace Studies or Military Science courses for an additional 6 semester hours' credit.

Uniforms are provided to ROTC students. The University requires a deposit of $25 from each basic student. This is refundable when the uniform is turned in, provided there is no damage to the uniform other than normal wear. Each advanced ROTC student is credited with a uniform allowance, paid by the Government to the University, which is used by the University to purchase officer-type uniforms for use during the junior and senior years. The uniform becomes the property of the student when he is commissioned.

AIR FORCE ROTC

The Air Force ROTC program provides for selected students an education vital to the career of a professional Air Force officer. Commissions in the United States Air Force are awarded to male students who qualify for enrollment and successfully complete the program.

The four-year program consists of the General Military Course (GMC) or basic course and the Professional Officer Course (POC) or advanced course. Both are general courses covering the organization and mission of the Air Force. A leadership development laboratory, known as Corps Training, is a part of both courses. The GMC consists of 2 years with 30 hours of classroom instruction and 30 hours of Corps Training each year. During the second year of the GMC, a cadet may apply for admission into the POC. This consists of 90 classroom hours and 30 hours of Corps Training each year.

Cadets enrolled in the POC under the four-year program attend a four-week training period at an Air Force base between their junior and senior years. This provides exposure to an Air Force environment which is beneficial in preparing cadets for future management positions.

The two-year program consists of a six-week preparatory training period, at an Air Force base during the summer between the student's sophomore and junior years, and the POC. The six-week preparatory period eliminates the requirement for completion of the GMC and training at an Air Force base while enrolled in the POC. Applicants for the two-year program must meet all eligibility requirements for POC enrollment. Entry into this program is highly competitive.

If accepted into the POC the cadet is placed under contract and, after satisfactory course completion and graduation, may be commissioned as a Second Lieutenant in either the Regular or Reserve components of the United States Air Force. To be eligible for enrollment in the POC a cadet must: (1) Make application. (2) Pass the Air Force Officer's Qualification Test. (3) Pass the Air Force physical examination. (4) Meet citizenship, age, and loyalty requirements. (5) Possess leadership ability and good moral character. (6) Successfully complete two academic years of the GMC or have received credit for its equivalent. (7) Enlist in the Air Force Reserve (Obligated Reserve Section) AFROTC. (8) Have two academic years remaining (including graduate study) at Clemson University at the time of entrance. (9) Be enrolled as a full-time student. (10) Have attained the academic standards required by the University and the Air Force. (11) Be selected by a board of Air Force officers.

POC cadets who intend to become Air Force pilots participate in the Flight Instruction Program (FIP) during their senior year. They receive, at Government expense, pilot training conducted by a civilian contract flying school. Students who are not qualified or do not desire pilot training may be considered for entry into the POC as candidates for navigator training or officer duty in non-flying categories.

AFROTC students who have demonstrated outstanding leadership and academic qualities may be designated distinguished cadets at the beginning of their senior year. Clemson's distinguished cadets are eligible to compete with distinguished cadets from other institutions for regular Air Force commissions which are awarded upon graduation from the University.

AFROTC provides scholarships to highly qualified AFROTC cadets each year. Each scholarship pays tuition, fees, and $75 per academic year for books, in addition to $50 per month to the recipient.

The Air Force offers outstanding opportunities for an AFROTC graduate to pursue studies leading to an advanced degree. The educational delay program allows an AFROTC graduate to have his call to active duty delayed until he receives his advanced degree.

The Air Force Institute of Technology (AFIT) offers graduate programs in scientific, technical, and other professional fields. These programs are conducted at the AFIT resident school, Wright Patterson AFB, Ohio, at selected civilian institutions, and through training-with-industries programs. AFROTC graduates are eligible to apply for AFIT schooling after they are called to active duty. Air Force officers receive full pay and allowances while attending school under the AFIT program.

ARMY ROTC

The Army ROTC instruction stresses an academic college-level program in content, scope, and intensity. Emphasis is placed on the development of the student's leadership, bearing, discipline, judgment and sportsmanship which will be a distinct asset in any profession that he may choose, military or civilian.

The General Military Science Program is conducted at Clemson (see Part V of this catalog for a description of courses). The program consists of a Basic Course for freshmen and sophomores and the Advanced Program for juniors and seniors. A student who has successfully completed the basic course, who meets the physical requirements, who has earned sufficient academic credits to be designated as an academic junior, and who is recommended by his instructors, may enter the Advanced Course offered during the junior and senior years. Successful completion of the Advanced Program qualifies the student for a regular or reserve commission in any of the arms or services of the United States Army.

Scholarship Program. Scholarships are available to selected ROTC students who are strongly motivated toward a career in the Army. Each scholarship pays for tuition, books and laboratory expenses, and, in addition, pays $50 a month for the duration of the award, except during the Advanced Course summer training camp at the end of the junior year when the pay is at the rate of $151.95 per month. Only students who participate in the four-year camp at the end of the junior year when the pay is one-half the rate of a Second Lieutenant's base pay with two or less years' service. Only students who participate in the four-year program are eligible. For further information concerning the scholarship program, contact the Office of the Professor of Military Science.

The requirements for formal enrollment in the Advanced ROTC Program are as follows:

Junior Year. Must have successfully completed all previous Military Science courses, have acquired a passing grade on a general intelligence test which is administered during the sophomore year, be physically qualified, and must have acquired the credits, a grade-point ratio of 2.0 and be designated an academic junior. The number of credits required for participation in the Advanced Course complements the academic requirements of the University and insures that the cadet receives his commission and his diploma simultaneously.

Senior Year. Must have successfully completed all previous Military Science courses and have attended summer camp, must be an academic senior, and have the cumulative grade-point ratio required for graduation.

Exceptions, where warranted, to the above general rules may be made by the Head of the Military Science Department.

During the four years of general military instruction, students will have the opportunity to indicate their preference for assignment to a particular branch. Final assignment authority remains with the Department of the Army and will be dependent upon such factors as the student's major academic course, class standing, qualities of leadership, the requirements and existing vacancies in the various branches of the Army, in addition to the student's choice.

Outstanding Army ROTC cadets who attain grades in the upper half of the class in academic subjects and the upper third in Military Science subjects during their junior year and who possess outstanding qualities of leadership, character and aptitude for military service may, with the approval of the University President, be designated as Distinguished Military Students by the Head of the Military Science Department. Those who maintain this outstanding record during their senior year may be designated Distinguished Military Graduates. A Distinguished Military Student may apply for appointment as a Second Lieutenant in the Regular Army.

Flight Training Program. An Army ROTC student in his fourth year of Military Science, or having completed his fourth year of Military Science, but not completed his academic requirements for graduation, may enroll in the Army ROTC Flight Training Program. If accepted, the student will receive 35 hours of ground school and 36½ hours of flight training at Government expense, after which the student may qualify for his FAA license and be recommended for further flight training upon entry on active duty. To be accepted in the Flight Training Program the candidate must agree that if commissioned at time of graduation, he will volunteer for Army Aviation Flight Training and assignment, and to serve on active duty as a commissioned officer for not less than three consecutive years from the date of completion of the Army Aviation Flight Training Course, in addition to meeting other physical and mental requirements.

ROTC students receiving commissions in the Regular Army or Army Reserve have the opportunity to apply for graduate school. If accepted by the Army, applicant may be allowed to delay entry upon active duty to complete graduate study.

The student who receives his commission through Army ROTC is appointed in the Army Reserve as a Second Lieutenant and called to active duty for 2 years. Graduates of the program who enter active duty for 2 years will acquire a 6-year military obligation, only 3 of which would be in the Ready Reserve.

A recapitulation of Army service obligation is listed below:

	Reserve Officers	*Regular Army*	*Reserve Flight Training Officers*
Active Duty	2 years	3 years	4 years (Approx.)
Ready Reserve	3 years	2 years	1 year
Standby Reserve	1 year	1 year	1 year

ROTC Requirement. For those students who matriculate initially at Clemson after the spring semester 1970, ROTC will no longer be a requirement for graduation. In order to resolve the requirements and status of students matriculating prior to the end of the spring semester 1970, the following requirements apply:

To be eligible for graduation all male students not otherwise exempted whose initial matriculation in Clemson University was:

(1) On or before August 29, 1968, must complete four semesters of ROTC courses.
(2) After August 29, 1968, but prior to January 17, 1969, must complete three semesters of ROTC courses.
(3) After January 16, 1969, but prior to January 5, 1970, must complete two semesters of ROTC courses.
(4) After January 4, 1970, but prior to May 9, 1970, must complete one semester of an ROTC course.
(5) After May 9, 1970, ROTC courses are not a requirement for graduation.

HISTORICAL STATEMENT

In 1889 the General Assembly of South Carolina accepted the bequest of Thomas G. Clemson, which set aside the bulk of the Clemson estate for the founding of a scientific and technical college. The institution was also established under the Morrill Land-Grant Act passed by the National Congress in 1862. Clemson University, therefore, is a member of the national system of Land-Grant Colleges and Universities.

In 1964, in recognition of the expanded offerings of the institution not only in the areas of agricultural and mechanical arts but also in the sciences and arts, the name of the institution was changed to Clemson University. This change by the Legislature, effective July 1, 1964, followed an earlier recommendation to that body by the Board of Trustees.

The nature of the institution is outlined in Mr. Clemson's will and its acceptance by the legislature.

The will in part reads:

> Feeling a great sympathy for the farmers of this State, and the difficulties with which they have to contend in their efforts to establish the business of agriculture upon a proper basis, and believing that there can be no permanent improvement in agriculture without a knowledge of those sciences which pertain particularly thereto, I have determined to devote the bulk of my property to the establishment of an Agricultural College upon the Fort Hill Place. My purpose is to establish an Agricultural College which will afford useful information to the farmers and mechanics; therefore it should afford thorough instruction in agriculture and the natural sciences connected therewith; it should combine, if practicable, physical with intellectual education; and should be a high seminary of learning in which the graduate of the common schools can commence, pursue and finish a course of studies terminating in thorough theoretic and practical instruction in those sciences and arts which bear directly

> upon agriculture . . . but to always bear in mind that the benefits herein sought to be bestowed are intended to benefit agriculture and mechanical industries. . . . I trust I do not exaggerate the importance of such an institution for developing the material resources of the State, by affording its youth the advantages of scientific culture.
>
> The desire to establish such a school or college, as I have provided for in my said last will and testament, has existed with me for many years past, and many years ago I determined to devote the bulk of my property to the establishment of an Agricultural School or College. To accomplish this purpose is now the one great desire of my life.

This will gave all that part of the Fort Hill Estate inherited by Mrs. Clemson from her mother and the bulk of Mr. Clemson's other real and personal property. The latter amounted to a sum, which, considering the purchasing power at the time, probably has been only a few times exceeded in a public benefaction in South Carolina.

A Board of Trustees of seven members was provided for: R. W. Simpson, D. K. Norris, M. L. Donaldson, R. E. Bowen, B. R. Tillman, J. E. Wannamaker, and J. E. Bradley, who with those chosen by the General Assembly, should constitute a governing board in the event the State accepted the bequest; but, who, in the event the State declined the bequest, should alone constitute a governing board for a private institution.

These seven trustees, along with other friends of the movement and the agricultural groups in the State, developed and organized a public opinion favorable to the plan.

In November, 1889, the General Assembly of South Carolina accepted the terms of the will and, following the decision of the United States Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas G. Clemson into the reality of Clemson College.

The College was formally opened in July, 1893, with an enrollment of 446 students. The first graduating exercises were held in December, 1896, with a graduating class numbering 37—15 in the agricultural courses and 22 in the engineering courses.

LOCATION

The University is located on the Fort Hill homestead of John C. Calhoun, in the foothills of the Blue Ridge Mountains. It has an elevation of 800 feet above sea level and commands an excellent view of the mountains to the north and west, some of which attain an altitude of over 5,000 feet.

The University is located at Clemson, S. C., on the main line of the Southern Railway, U. S. Highways numbers 76 and 123 pass through Clemson, and daily bus service at regular intervals is available.

ALUMNI RELATIONS

The office of alumni relations coordinates all functions and services of the alumni office. The director of alumni relations is secretary of the Clemson Alumni Association and the Clemson Foundation through election by the governing boards of these two organizations.

Accurate records of addresses and information concerning alumni are being compiled by this office which also publishes a magazine and newsletter for distribution to the alumni.

The purpose of the Alumni Association is to serve the University and its alumni in every possible way. The Association holds its regular annual meeting at the University each June. Active membership is made up of former Clemson students who participate in the Clemson Alumni Loyalty Fund for the purpose of providing supplementary financial aid to the educational programs of the University.

The Clemson University Foundation was founded by interested members of the Alumni Association to raise an endowment to be used for the benefit of the University, its students, faculty and alumni. Trustees of the Foundation are elected by the Association.

THE J. E. SIRRINE TEXTILE FOUNDATION

Funds in this foundation were contributed by the members of the textile industry in South Carolina and amount to about one million dollars. Income from this fund is administered by the trustees of the J. E. Sirrine Textile Foundation. They have used the income to benefit textile teaching and research at Clemson University. Under the present system it is used to (1) supplement university travel funds for faculty members, (2) sponsor the school library by paying the salary of the librarian and paying for periodicals and books, (3) provide supplement to the salaries for two major professors, (4) provide four graduate fellowships annually, one of which may be held by a faculty member, (5) sponsor at Clemson annual seminar for South Carolina high school counselors, (6) and support special research projects.

STUDENT LIFE AND ACTIVITIES

PART III

PART III—Student Life and Activities

STUDENT BODY

The students of Clemson University believe that student government is necessary and beneficial and that every student should be represented in this government. All registered undergraduate and graduate students are upon payment of the Student Activities Fee members of the Student Body of Clemson University which in turn is represented by the student government.

Student government is actively sponsored and highly effective at Clemson. The three branches of government are patterned after our federal system; however, there are no political parties within the framework of this student organization. March and April are election months for student-body and class officers except for the freshman class which holds class-officer and Student Senate elections in September. Students interested in self-government are encouraged to participate in this active student organization.

WOMEN'S STUDENT ASSOCIATION

The purpose of the Women's Student Association is to plan and to coordinate activities for women students at Clemson University. W.S.A. also coordinates the activities of the various women's dormitories.

STUDENT PUBLICATIONS

The *Chronicle* is a student variety magazine published four times a year.

The *Taps* is the yearbook published by the students of the University.

The Tiger is a weekly paper published by the students of the University.

THE STUDENT CENTER

The student center, located in Johnstone Hall, has a student lounge with space for reading and games and two television sets. On the third floor there are meeting rooms and the student chapel. Also in this area are the offices of student publications, such as *The Tiger*, student newspaper; the *Taps*, annual publication; and Radio Station WSBF. The visitors' lounge and the information center are on the first floor off the loggia. The bookstore, post office, and canteen are located on the levels below the loggia.

CULTURAL, MUSICAL, THEATRICAL ACTIVITIES

University Concert Series

Each year since 1940 Clemson University has sponsored a concert series. All Clemson students paying full-time student activities fees are admitted to these concerts without charge. Others, including faculty members, may purchase tickets at a moderate cost.

The Program of Concerts for 1970-71 is:

Melbourne Symphony Orchestra—Willem van Otterloo conducting
Coldstream Guards and Black Watch—a British Military Spectacular
Ciro and his Ballet Flamenco
Leonard Pennario, pianist
The Johann Strauss Ensemble of the Vienna Symphony Orchestra
The Dorian Woodwind Quintet and Morton Subotnick's "Misfortunes of the Immortals"

Architectural Foundation Lectures and Exhibits

The College of Architecture at Clemson is able to present annually an outstanding series of lectures, which are open to all Clemson students, through financial grants from the Clemson Architectural Foundation. The Foundation also presents an annual schedule of at least 12 art exhibits in the Architectural College gallery, which is open to the public weekdays between 9 a. m. and 4:30 p. m.

University Bands

Tiger Band. The Tiger Band and Color Guard, composed of approximately 100 members, participate in football games, pep rallies, functions, and parades throughout the South. This band has appeared in major stadiums in many states, including the Gator, Orange, Sugar, and Bluebonnet Bowls and has performed on national television. The Tiger Band makes several out-of-town trips during the fall season. A smaller "pep band" from its ranks performs at all home basketball games.

Concert Band. The Clemson Concert Band is composed of the better musicians on campus. It is formed at the end of the football season, and gives concerts both on and off the campus, including a tour in the spring. This organization plays music of the great composers in addition to lighter fare.

Army and Air Force ROTC Bands. These bands participate in all major military functions, including ceremonial parades and reviews. (Admission is open to all qualified ROTC personnel.)

Glee Clubs. There are two choral organizations active on the campus for students interested in formal singing activities. The Clemson Glee Club consists of fifty members and is open to male students. For female students, there is a Women's Glee Club. Throughout the school year, these groups perform for many campus events, including full-length concerts. In the spring, a tour of South Carolina and nearby states is made. Audition is required for membership.

Clemson Players. This is the dramatic club of the University and is open to all students interested in dramatics. Four productions are presented annually.

THE YOUNG MEN'S CHRISTIAN ASSOCIATION

The Young Men's Christian Association at Clemson was organized in 1894, one year after the college was established, and has since then served both the University and the community to promote growth in Christian character through a well-balanced program of religious, social, recreational, and counseling activities. Because the YMCA is not specifically concerned with any particular denominational group, its program cuts across denominational lines and is interested in students of the University regardless of denominational affiliation or if they have no denominational affiliation.

Some of the activities which are promoted by the YMCA are the meditations in the student chapel, meditations on the halls where students live, residence hall forums, participation in religious emphasis programs throughout the year, and deputations to other colleges, universities, and high schools. The YMCA also coordinates the overall religious program of the local church groups.

The YMCA offers space and facilities for such activities as drop-ins, dances, television programs, music concerts, as well as physical activities, such as basketball, swimming, table tennis, billiards, and the social and recreational activities involved in the YMCA's program. A new feature of the YMCA's program is the development of a recreational area across the lake from the campus, comprising twenty-five acres with a nice beach, bathhouse, and a headquarters building for recreation.

The Young Men's Christian Association at the University is under the direction of an Advisory Board composed of members of the faculty, administration, alumni, and members at large. There is a full-time staff of four men and one woman whose efforts are to give direction to the social, recreational, and religious life of students.

The student policy group is the YMCA Cabinet, which meets weekly to evaluate and promote the activities which appeal to students.

RELIGIOUS LIFE

Religious life at Clemson University is coordinated by the University YMCA with the Director of the YMCA serving as coordinator.

The YMCA building provides a meeting place for denominational groups not having a church at Clemson as well as for many interdenominational groups. The Student Center, which is located in the dormitory, has a chapel which is used by all of the religious groups as scheduled.

The student religious organizations at Clemson offer the student the opportunity to grow spiritually and socially. These organizations are:

Baptist Student Union
Clemson Canterbury Association (Episcopal)
Christian Science Organization
Hillel-Brandeis (Jewish)
Lutheran Student Association
Newman Student Association (Catholic)
Westminster Fellowship (Presbyterian)
Clemson Wesley Foundation (Methodist)

CAMPUS LEADERSHIP AND SERVICE

Block "C" Club—The Block "C" Club includes varsity lettermen in baseball, basketball, football, track, cheerleading, swimming, and soccer.

Tiger Brotherhood—A local honorary service fraternity composed of men students from the upper three classes who have demonstarted ability, character and loyalty to Clemson University.

Circle"K" International—International Service Club for college men sponsored by Kiwanis International.

Central Dance Association—The C.D.A. staff is responsible for planning and coordinating major dance weekends at which time name entertainment is brought to the campus.

WSBF—WSBF is an educational radio station managed, maintained and operated by a student staff for the enjoyment of the Clemson student body and the surrounding academic community. The station broadcasts 24 hours a day on both open circuit FM and closed circuit AM from a modern studio in the University Student Center.

Order of Athena—A local honorary society for senior women who have maintained a high standard of scholarship, demonstrated leadership, and shown a spirit of service to the University.

NATIONAL HONOR SOCIETIES

Clemson University has chapters of the following members of the Association of College Honor Societies:

Delta Sigma Rho–Tau Kappa Alpha (Forensics)
Phi Eta Sigma (Scholarship—Freshman Men)
Phi Kappa Phi (Scholarship—Senior Men and Women)
Tau Beta Pi (Engineering—Men and Women)
Tau Sigma Delta (Architecture and Allied Arts—Men and Women)

Other Honor Societies:

Sigma Xi (Scientific Research—Men and Women)
Xi Sigma Pi (Forestry—Men)

NATIONAL RECOGNITION SOCIETIES

The following national recognition societies have chapters established at Clemson:

Alpha Phi Omega (Campus Service—Men)
Alpha Zeta (Agriculture)
Angel Flight (Air Force—Women)
Arnold Air Society (Air Force—Men)
Block and Bridle Club (Animal Science)
Blue Key (Scholarship, Leadership, Service—Men)
Iota Lambda Sigma (Industrial Education)
Pershing Rifles—Company C-4 (Military)
Pershing Rifles—4th Regimental Headquarters
Scabbard and Blade—Company K-7 (Military)

DEPARTMENT AND PROFESSIONAL ORGANIZATIONS

Agricultural and Biological Sciences Council
Alpha Tau Alpha (Agricultural Education)
American Agricultural Economics Association
American Association of Textile Chemists and Colorists
American Association of Textile Technology
American Ceramic Society
American Chemical Society
American Dairy Science Association
American Institute of Architects
American Institute of Chemical Engineers
American Society of Agricultural Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
American Society for Metals
Associated General Contractors of America, Inc.
Calhoun Forensic Society
Calhoun Literary Workshop
Capers (Co-ed Pershing Rifles)
Counter Guerrilla Platoon
Delta Sigma Nu (Pre-med)
Economics Club
Food Science Club
Forestry Club
Gamma Alpha Mu (English)
Geology Club
Graphic Arts Society
Horticulture Club
Institute of Electronic and Electrical Engineers
Iota Mu Sigma (Industrial Management)
Kappa Alpha Sigma (Agronomy—Crops and Soils)
Keramos (Ceramics)
Light Brigade (Army—Women)
McConnell Society (German)
Mu Beta Psi (Music)
Newtonian Society (Mathematics)
Outing Club
Phi Psi (Textile Arts)

Poultry Science Club
Pre-law Society
Pre-veterinary Club
Recreation and Parks Administration Club
Sigma Pi Sigma (Physics)
Sigma Tau Epsilon (Arts and Sciences)
Society for the Advancement of
  Agricultural Education
Society for Advancement of Management
Society for American Military Engineers
Society of Physics Students
Young Philosophers' Club

GENERAL ORGANIZATIONS

Aero Club
Amateur Radio Club
Bowling Team
Campus Crusade for Christ
Chess Club
Dixie Skydivers Sport Parachute Club, Inc.
Fellowship of Christian Athletes
Fencing Club
Fine Arts Film Club
Four-H Club
Gamma Beta Phi (Beta Club Members)
Gamma Omega Phi (Political)
The Oxfords
Rifle Club
Sailing Club
Skin and Scuba Diving Club
Sentimental Jazzmen (Music)
Sigma Psi Nu (Swimming)
Southern Students Organizing Committee
Sports Car Club
Student League for Black Identity
Students for Educational Aid
Tae Kwon Do Club (Karate)
University Political Caucus
Weightlifting Club
Young Democrats Club
YMCA Cabinet
Young Republicans Club

SOCIAL FRATERNITIES AND SORORITIES

The Board of Trustees, together with the President and Vice-President for Student Affairs, of Clemson University have given formal approval to opening the Clemson campus to national fraternities and sororities. The local fraternities and sororities expect to affiliate with national groups during the 1969-70 academic year. At the present time, there are eleven local fraternities and three local sororities on the campus.

Fraternities

Alpha Gamma
Beta Sigma Chi (Associate)
Chi Lambda
Delta Kappa Alpha
Delta Phi Kappa
Kappa Delta Chi
Kappa Sigma Nu
Numeral Society
Phi Kappa Delta
Sigma Alpha Zeta
Sigma Kappa Epsilon

The Interfraternity Council serves as the coordinating and governing body of the social fraternities.

Sororities

Delta Theta Chi
Omicron Zeta Tau
Sigma Beta Chi

The Intersorority Council coordinates the activities of the social sororities.

REGIONAL CLUBS

The regional clubs of Clemson University are composed of international clubs, out-of-state clubs and clubs representing the various counties in the state. The regional clubs are made up of students who wish to unite with other students from their own home areas. These clubs include:

International Student Association
Kappa Delta Kappa (Dillon County)
Colleton County Club
Pi Kappa Rho (Pickens County)

ATHLETIC PROGRAM

The University encourages students' interests in sports through a program of intercollegiate athletics and intramural sports.

It is a member of the Atlantic Coast Conference and its athletic teams, The Tigers, regularly play teams of that conference and other colleges. Membership of the Atlantic Coast Conference includes—

in addition to Clemson University—Duke University, North Carolina State University, University of Maryland, University of North Carolina, University of South Carolina, University of Virginia, and Wake Forest University.

The intercollegiate athletic program includes football, basketball, baseball, track, tennis, golf, swimming, cross-country, and soccer. Each year over 200 teams are formed in softball, football, volleyball and basketball in the intramural program, with champions determined in each sport through a tournament.

Among the facilities for intramural and intercollegiate athletics at the University are tennis courts, baseball and track facilities, an indoor swimming pool, and a football stadium which will accommodate almost 50,000 people. The Littlejohn Coliseum, with a seating capacity of approximately 10,000 for basketball and up to 12,000 for other events, was completed in 1968. The Fike Fieldhouse is being renovated to accommodate intramural activities.

AUTOMOBILE PRIVILEGES AND PARKING REGULATIONS

All motor vehicles owned and operated on the campus by students, faculty, and staff members must be registered with the designated authorities. On registering, each student, faculty, or staff member will be offered a copy of the parking and traffic regulations and will be issued a decal which will indicate the areas in which the car may be parked.

Students are urged to familiarize themselves with all provisions of the Traffic Ordinance contained in *The Traffic Code of Clemson University*.

SCHOLASTIC REGULATIONS

PART IV

PART IV—Scholastic Regulations

SCHOLASTIC REGULATIONS

Academic Standards. Proper discharge of all duties is required at Clemson University, and a student's first duty is his scholastic work. All students should be thoroughly acquainted with and cognizant of these basic requirements.

The Credit System. The semester hour is the basis of all credits. Generally, one recitation hour or 3 laboratory or shop hours a week for a semester constitute a semester hour. Thus, in Engl 101, English Composition, 3 cr. (3,0), as you will find this subject listed in the Degrees and Curriculums, the student takes 3 semester hours. When he completes this course satisfactorily, he is granted 3 semester credit hours on his record. The notation "3 cr. (3,0)" means that the course carries 3 credits, has 3 clock hours of theory or recitation per week, and no laboratory hours. Ch 101, General Chemistry, 4 cr. (3,3), carries 4 semester hours, has 3 hours of theory, and a 3-hour laboratory period.

The amount of work required for each credit will vary with the student's capabilities. In general, it is anticipated that each semester hour credit will require 3 hours work per week for average students. Thus, a 1(1,0) course would have 1 hour of lecture per week and require 2 hours of outside preparation. A 1(0,3) course would require 3 hours of laboratory work and no time for outside preparation.

Semester Grades. The standing of a student in his work at the end of a semester is based upon daily class work, tests or other work, and the final examinations. Faculty members may excuse from the final examinations all students having the grade of A on the work of the course prior to the final examination, but for all other students written examinations are required in all subjects at the end of each semester, except in certain laboratory or practical courses in which final examinations are not deemed necessary by the department faculty.

Scholastic reports are mailed to parents four times each year, including a preliminary statement of progress near the middle of each semester, and a final report at the end of each semester.

The Grading System. The grading system is as follows:

A—*Excellent.* Indicates that the student is doing work of a very high character. The highest grade given.

B—*Good.* Indicates work that is definitely above average, though not of the highest quality.

C—*Fair.* Indicates work of average or medium character.

D—*Pass.* Indicates work below average and unsatisfactory. The lowest passing grade.

F—*Failed.* Indicates that a student knows so little of the subject that it must be repeated in order that credit may be received.

I—*Incomplete Work.* Indicates that a relatively small part of the semester's work remains undone. Grade I is not given a student who has made a grade F on his daily work. Students are allowed 30 days after the beginning of the next semester in which the student is enrolled to remove the incomplete grade unless (1) an extension of time is approved by the instructor concerned, or (2) within one year of residence after receiving such a grade, a student repeats the conditioned course satisfactorily at Clemson, in which case no credit hours taken shall be recorded for the grade of I. A student who elects to repeat an incomplete course is responsible for notifying the Office of Admissions and Registration of his election during the semester in which the course is taken. This regulation applies only to the first time that a course is repeated.

In order to make up incomplete work, the student must first obtain a permit card from the Office of Admissions and Registration. This card serves as the authority for the removal of the I and also as a form for reporting the final grade.

WP—*Withdrew Passing.* This grade indicates that the student withdrew from the course while doing satisfactory work. No credit hours taken are recorded for the grade of WP provided that the course is dropped prior to the last three weeks of classes in the semester. Only semester grades shall be given and recorded for courses dropped during the last three weeks.

WF—*Withdrew Failing.* Indicates that the student withdrew from the course while doing unsatisfactory work. The credit hours of a subject on which the grade of WF is received are counted as credits taken in computing the student's grade-point ratio.

Dropping Class Work. A subject dropped after the first four weeks of class work is recorded as "Withdrew Passing" or "Withdrew Failing" depending upon the student's grade in the course at the time the subject was dropped.

Upon the recommendation of the instructor and the dean concerned, a student's standing will be investigated and he may be required to drop a subject because of neglect, or lack of application or preparation. No student will be dropped under this rule without approval of the President.

Removal of Failures. A student who has failed (made a grade F) in a subject cannot receive credit for that subject until it has been satisfactorily repeated hour for hour in class, except that in the case of correlated laboratory work, the number of hours to be taken shall be determined by the instructor. Where separate grades for class and laboratory work are given, that part of the subject shall be repeated in which the failure occurs.

Rescheduling Courses Failed. A student who wishes to reschedule a course he has failed must do so within his next year of residence, or, if the course is not offered during this year of residence, he must reschedule the course the first time it is offered thereafter during his attendance at Clemson.

Rescheduling Courses Passed. A student may repeat a course he has passed with a grade lower than B provided he does so within three semesters of residence after the completion of his original enrollment in the course.

Scheduling Remedial Mathematics. Any student who has passed a course in freshman mathematics is ineligible to enroll in Remedial Mathematics.

Withdrawal from the University. A student may withdraw from the University any time before the last three weeks of classes in the semester without having grades recorded. A student enrolled the last three weeks of classes shall have final semester grades recorded.

A student withdrawing from college after preliminary reports are due must be passing a minimum of 12 semester credit hours at the time of withdrawal to qualify for re-enrollment the following semester.

After the first withdrawal from college the student is eligible to continue his enrollment the following semester, provided he meets other applicable regulations. For each succeeding withdrawal, however, the student shall be ineligible to continue his enrollment the following semester unless there are extenuating circumstances approved by the Committee on Admissions.

Grade Points. Four grade points are assigned for each credit hour on which the student receives the grade of A, 3 grade points for each credit hour of grade B, 2 grade points for each credit hour of grade C, and 1 grade point for each credit hour of grade D. No grade points are assigned for grades F, I, WP, or WF.

Grade-Point Ratio. In calculating a student's grade-point ratio, the total number of grade points accumulated by the student is divided by the total number of credit hours taken by the student at Clemson during the semester, session, or other period for which the ratio is calculated.

Minimum Requirements for Continuing Enrollment. At the end of the academic year in May, all student records are inspected for quality. At that time in order to be able to continue his enrollment, a student who has taken a total of:

(a) 24 to 59 credit hours at Clemson must have a cumulative grade-point ratio of 1.30 or above.

(b) 60 to 89 credit hours at Clemson must have a cumulative grade-point ratio of 1.50 or above.

(c) 90 or more credit hours at Clemson must have a cumulative grade-point ratio of 1.70 or above.

A student completing a regular session has the privilege of continuing his enrollment through the immediately following summer session at Clemson or in Clemson parallel programs in an effort to meet the above requirements.

A student who has taken fewer than 90 credit hours at Clemson and who fails to meet the required grade-point ratio, as indicated in the table above, may apply for readmission after a minimum of one semester has elapsed. A student who has taken 90 or more credit hours and fails to meet the required grade-point ratio is permanently ineligible for readmission. Any exceptions to these minimum requirements for continuing enrollment and readmission must be approved by the Admissions Committee of the University.

Advanced Placement by Examination. In addition to earning credit by the usual method involving classroom attendance, students may receive credit toward their degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Credit by Examination. Credit may be earned by means of a special examination without the necessity of class attendance subject to the following requirements:

(1) The applicant must present evidence which would indicate that he has received training or taken work which is approximately equivalent to that given in the course at Clemson for which an examination is requested and that an examination is warranted.

(2) The applicant must not have previously failed or audited the course at Clemson.

(3) The applicant must apply in writing for the examination and the request must be approved by the Instructor, Head of the Department in which the course is taught, Dean of the College or School in which the course is taught, and the Dean of Admissions and Registration.

(4) A grade of not less than C on the examination is necessary in order for the examinee to receive credit on the course. An examinee receiving credit under this provision receives credit for "hours taken," "hours earned," and grade points as well as the course grade.

(5) The time of the examination will be arranged by the student with the instructor concerned, but must be taken within one month after the date of final approval or it will be necessary for the student to initiate another request.

Work Taken at Another Institution. Clemson students may receive credit for work taken at another institution; however, approval of the work should be obtained by the student prior to scheduling the work. Information and forms relative to this approval may be obtained in the Office of Admissions and Registration. By obtaining advance approval the student is assured of receiving proper credit at Clemson provided he passes the work with a grade one letter grade higher than the lowest passing grade.

Classification. All new students are classified as freshmen unless they have attended another college prior to entrance. For those students who have completed college work elsewhere, classification will be based on semester hours accepted at Clemson rather than the amount of work presented.

To be classified as a sophomore, a student must have completed at least 30 semester hours.

To be classified as a junior, a student must have completed at least 60 semester hours.

To be classified as a senior, a student must have completed at least 95 semester hours.

Regular Advancement in Classification. All students are urged to meet the requirements for sophomore classification by the beginning of the second year, for junior classification by the beginning of the third year, and for senior classification by the beginning of the fourth year. Failure to meet these requirements can jeopardize a student's academic standing with the University as well as jeopardize his deferment under the Selective Service even though he may be otherwise eligible for the deferment.

Course Prerequisites. Prerequisites for individual courses are enumerated under the course listings in the Description of Courses. In addition to these requirements, colleges, schools, and departments may also establish other standards as conditions for enrollment. In the College of Engineering a grade-point ratio of 1.80 or higher is required for registration in all Engineering courses numbered 300 or higher.

Credit Load. Except for an entering freshman, who is restricted to the curriculum requirements of his major course, the credit load for an undergraduate must be approved by his class adviser. The class adviser will approve a credit load deemed in the best interest of the student based on such factors as course requirements, grade-point ratio, participation in other activities, and expected date of graduation.

Since grades are an important factor in determining credit loads, the student should be guided by the following table in presenting his schedule to his class adviser for approval:

Grade-Point Ratio (Semester or Cumulative, Whichever Is Higher)	*Recommended Maximum Number of Semester Hours to Be Scheduled*
0.00 to 0.99	14 to 16
1.00 to 1.99	16 to 18
2.00 to 2.99	18 to 20
3.00 to 4.00	20 to 22

When any full-time student reduces his credit load below 12 hours, but is still carrying 9 or more, he may be suspended for at least the remainder of the semester upon recommendation of the Vice-President for Student Affairs and approval of the President. When a student reduces his credit load below 9 hours he shall be suspended for at least the remainder of the semester.

Auditing Policies. Qualified students may audit courses upon the written approval of the professor, head of the department and the dean of the college or school concerned, and registration with the Dean of Admissions and Registration. Auditors are under no obligation of regular attendance, preparation, recitation, or examination and receive no credit. Participation in classroom discussion and laboratory exercises by auditors is at the discretion of the instructor. A student who has previously audited a course is ineligible for credit by examination.

A full-time undergraduate student with approval may audit courses at no additional charge as long as the student's credit load, including the course audited, is approved by his class adviser.

A graduate student regularly enrolled for a minimum of six semester hours may with approval audit one additional course without charge.

Members of the University teaching staff and the professional staff in research and agricultural extension may with approval audit courses without charge. Other full-time University employees may audit without charge with the additional approval of the employee's immediate supervisor and the Comptroller.

Residence Requirement for Graduation. In order to qualify for an undergraduate degree, a student must spend at least the last year of residence at Clemson and complete at Clemson a minimum of 30 of the last 36 credits presented for the degree.

Honors Program. The Honors Program at Clemson University provides for the fuller development of our most able students. They meet in small classes with outstanding professors and explore the subject matter of a course in greater depth than other students are able to do. The identification and selection of Honor Students begins with their freshman year, and Honors courses are provided at all four levels of undergraduate instruction. To remain in the Honors Program a student must maintain a cumulative grade-point ratio of 3.00.

An Honors Council composed of faculty members from each College and School is responsible for planning and supervising the Honors Program. *The Honors Program: A Student Handbook* is available for those who are interested.

Honors and Awards Day. Each spring an Honors and Awards Day is held for students who qualify for the honor list and for special awards. A cumulative grade-point ratio of 3.00 to 3.49 is required for listing with honor, 3.50 to 3.79 for high honor, and 3.80 or above for inclusion with highest honor.

Honor Graduates. Students who graduate in the Honors Program will have this fact indicated on their diplomas. Other graduates who meet the required qualifications are designated as having graduated with honor. A grade-point ratio of 3.00 to 3.49 is required for graduation with honor, 3.50 to 3.79 for high honor, and 3.80 or above for graduation with highest honor.

Examination on F Received in Last Semester. A candidate for a degree who in the semester immediately prior to graduation fails to graduate because of an F on one course taken in that semester may stand a special examination on the course provided:

(1) That the candidate can furnish evidence of having done satisfactory study for the examination.

(2) That the examination is not given until after the regular degree date.

(3) That the candidate has fulfilled, prior to the due date for candidates' grades, all other requirements for his degree except those which can be fulfilled by passing the examination.

(4) That the candidate by removing the F by examination will finish all requirements for his degree which will be awarded on the next regular date for award of degrees.

Make-ups of I's Received in Last Semester. A candidate for a degree who in the semester immediately prior to graduation receives one or more grades of I shall have an opportunity of removing the unsatisfactory grades provided the final grades are received in the Office of Admissions and Registration by the time grades for candidates for graduation are due.

A candidate who qualifies for graduation under this regulation will be awarded his degree on the regular date for the award of degrees.

Special Graduation Requirements. A cumulative grade-point ratio of 2.00 is required for graduation. Candidates for degrees are required to apply for their diplomas within two weeks following the opening of the final semester or the opening of the summer session prior to the date the degrees are to be awarded. These applications should be filled out in the Office of Admissions and Registration on the regular blanks provided.

All work for a degree must be completed, all financial settlements made, and all government property and library books returned by 5 p. m. on the Tuesday preceding graduation.

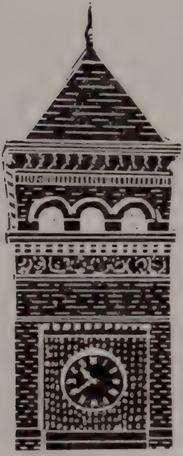
A student in line for graduation at the end of this semester who fails to graduate because of an F on one course taken this semester may stand a special examination under certain conditions on the course *after the regular degree date.* A senior who qualifies for graduation under this provision will be awarded his degree *on the next regular date* for the award of degrees. For further information see paragraph **Examination on F Received in Last Semester.**

A student in line for graduation at the end of a semester or summer term who meets all requirements for graduation except for a deficiency in his grade-point ratio resulting from a deficiency of not more than six grade points shall have the privilege of making up his deficiency by standing special re-examinations under certain conditions.

The examinations shall be taken after the regular degree date and in courses totaling not more than 6 semester credit hours which were passed during the last year of residence, and only one such examination may be taken on an individual course. When such examinations are taken under the above provision, the credit hours of the course or courses will not be counted as additional credit hours taken. Only the grade points over and above the grade points previously earned in the course may count toward raising the grade-point ratio.

A student who qualifies for graduation under this provision will be awarded his degree on the next regular date for the award of degrees.

If all work toward a degree is not completed within five years after entrance, the student may be required to take additional courses.



DEGREES AND CURRICULUMS

PART V

PART V—Degrees and Curriculums

BACHELORS' DEGREES

The degree of Bachelor of Science is awarded to those students who satisfactorily complete one of the four-year curriculums offered under the College of Agriculture and Biological Sciences or the College of Engineering. In the College of Education, the Bachelor of Science degree is awarded to those completing the requirements in Agricultural Education, Industrial Education, Recreation and Park Administration, and Science Teaching. The Bachelor of Arts degree is granted to those completing the curriculum in Elementary Education or the Secondary Education curriculum with a teaching major in Economics, English, History, Modern Languages, Mathematics, Natural Sciences, Political Science, Psychology, or Sociology. In the College of Industrial Management and Textile Science, the Bachelor of Arts degree is awarded to those completing the curriculum in Economics; and the Bachelor of Science degree is awarded to those completing the requirements in Accounting, Administrative Management, Financial Management, Industrial Management, Textile Chemistry, or Textile Science. In the College of Liberal Arts, the Bachelor of Arts degree is awarded to those students who satisfactorily complete the curriculum with major concentrations in English, History, Modern Languages, Political Science, Psychology, or Sociology. In the School of Nursing, the Bachelor of Science degree is awarded to those students completing requirements in the four-year Nursing curriculum. In the College of Physical and Mathematical Sciences, the Bachelor of Science degree is awarded to those students completing the requirements in Chemistry, Geology, Mathematics, Medical Technology, Physics, or Pre-medicine, and the Bachelor of Arts degree is awarded to those completing the Arts and Sciences curriculum.

The College of Architecture offers a six-year professional program embracing two degrees and leading to the professional degree, Master of Architecture. After the first degree, students may opt to seek the Master of City and Regional Planning degree offered by the College. The degree of Bachelor of Arts in Pre-architecture requiring 137 credit hours is awarded at the end of four years and the first professional degree, Master of Architecture, includes 68 additional semester hours for a total of 204.

The Bachelor of Science degree in Building Construction is a four-year program requiring 141 credit hours.

ASSOCIATE DEGREE

The School of Nursing offers, in addition to the baccalaureate program in nursing, an Associate in Arts degree program in nursing. This program normally requires four semesters and one summer term, a minimum of 71 semester credit hours.

GRADUATE DEGREES

The degrees of Doctor of Philosophy, Master of Arts, Master of Science, Master of Agricultural Education, Master of Architecture, Master of City and Regional Planning, Master of Education, and Master of Industrial Education are awarded to those students who satisfactorily complete prescribed graduate programs.

For further information concerning advanced degrees see *The Graduate Bulletin*, which may be obtained from the Office of the Dean of the Graduate School.

UNDERGRADUATE CURRICULUMS

Forty-seven undergraduate curriculums are offered under the Colleges of Agriculture and Biological Sciences, Architecture, Education, Engineering, Industrial Management and Textile Science, Liberal Arts, and Physical and Mathematical Sciences, and the School of Nursing. The curriculums under each college and school are listed below:

College of Agriculture and Biological Sciences
- Agricultural Economics
- †Agricultural Education
- *Agricultural Engineering
- Animal Industries
- Biology
- Food Science
- Forestry
- Plant Sciences
- Pre-veterinary

College of Architecture
- Building Construction
- Pre-architecture

College of Education
- †Agricultural Education
- Early Childhood Education
- Elementary Education
- Industrial Education
- Recreation and Park Administration
- Science Teaching
- Secondary Education

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† Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

* Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

- College of Engineering
  - *Agricultural Engineering
  - Ceramic Engineering
  - Chemical Engineering
  - Civil Engineering
  - Electrical Engineering
  - Engineering Analysis
  - Mechanical Engineering
  - Technical Operations
- College of Industrial Management and Textile Science
  - Accounting
  - Administrative Management
  - Economics
  - Financial Management
  - Industrial Management
  - Textile Chemistry
  - Textile Science
- College of Liberal Arts
  - English
  - History
  - Modern Languages
  - Political Science
  - Psychology
  - Sociology
- School of Nursing
  - Baccalaureate Program
  - Associate Degree Program
- College of Physical and Mathematical Sciences
  - Arts and Sciences
  - Chemistry
  - Geology
  - Mathematics
  - Medical Technology
  - Physics
  - Pre-medicine or Pre-dentistry
  - Pre-pharmacy

In the curriculums which follow are given the official title and number of the course, the descriptive title, the number of semester hours credit, and in parentheses the number of hours per week in class and laboratory, respectively.

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

The undergraduate curriculums offered by this College are presented under two classifications—*Agriculture* and *Biological Sciences.*

AGRICULTURE

Modern agriculture is the science, business, and art of producing, processing, and distributing plant and animal products, including those aspects of economics and human relations connected with these activities. Agriculture is a unique area in education because it applies the basic sciences to biological material for economic implications.

Today's agriculture includes much more than farm production. About 6 million people provide supplies and services for farmers

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* Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

and 10 million process and distribute farm products. These two segments together with farm production, which employs 5 million workers, provide jobs somewhere in agriculture for 21 million Americans—approximately one-third of all jobs.

Thousands of agricultural graduates are needed each year in this basic industry. Our land-grant colleges and universities are now graduating considerably less than the total number needed to fill the jobs available each year—jobs important to every person, jobs with futures, jobs with challenge, jobs with personal and financial rewards.

The total program in Agriculture at this institution includes Resident Instruction, Research (Agricultural Experiment Station), and Extension (Agricultural Extension Service). Organized under Resident Instruction are curriculums in Agricultural Economics, Agricultural Education,* Agricultural Engineering,† Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), Biology (major in Entomology), Food Science, Forestry, Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental), and Preveterinary Medicine.

The curriculums in Agriculture are continuously revised to meet the changing needs of this dynamic industry. In this connection, students in many of the curriculums now have the opportunity to specialize by choosing a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

Science Minor—This minor emphasizes the basic sciences that prepare students to contribute to the advancement of knowledge in their respective fields. It is designed for students whose anticipated work requires considerable scientific training, usually including graduate studies. Employment opportunities include research with State Agricultural Experiment Stations, the United States Department of Agriculture, and industrial and commercial organizations; and teaching in colleges of agriculture, and other educational work with Federal, State and industrial organizations.

Business Minor—This minor emphasizes principles and practices of business management as applied to businesses and industries associated with agriculture. It is designed for students who plan to work with one of the many businesses and industries that provide supplies and services for the farmer, and process and distribute farm products. Employment opportunities include work related to meat and poultry processing, sales and service of farm machinery, manufacturing and sales of fertilizers and pesticides, dairy and food processing, grain and seed processing, feed manufacturing, banking and credit, insurance, farm management, land appraising, and the marketing of agricultural commodities.

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* Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

† Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

Production Minor—This minor emphasizes the application of scientific principles to agricultural production. It is designed for students whose anticipated work requires broad general training in scientific and practical agriculture. Employment opportunities include general and specialized farming; agricultural extension services; teaching vocational agriculture; conservation of natural resources; agricultural communication; and agricultural services of the United States Department of Agriculture, State Departments of Agriculture and private enterprises.

International Agriculture Minor—This minor emphasizes the international aspects of agriculture and applies basic scientific principles and agricultural practices to worldwide agriculture. It is designed for students who contemplate work in international agricultural positions either in the United States or abroad. Employment opportunities include positions with the Foreign Agricultural Service of the United States Department of Agriculture, with foundations such as the Ford Foundation, with the Agency for International Development, with industries such as United Fruit Company, and with other domestic and foreign interests.

Second Department Minor—This minor emphasizes special training in an area of study other than the major. A *Second Department* minor may be selected either within or outside of the College of Agriculture and Biological Sciences. It is designed for students who wish additional specialized training outside their major area of study. Additional information relative to employment opportunities open to students with a minor in a *Second Department* is given elsewhere in this catalog under the various curriculum listings.

To illustrate further the types of work in which graduates engage, a few of the many occupations of agricultural graduates are listed under each curriculum.

FRESHMAN YEAR CURRICULUMS

[For students in Agricultural Economics, Agricultural Education, Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), and Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental.[*])]

First Semester			*Second Semester*		
Ag 101 Introd. to Agric.	1	(1,0)	Ch 102 Gen. Chemistry	4	(3,3)
Bot 101 Gen. Botany	4	(3,3)	Engl 102 English Composition	3	(3,0)
or Zool 101 Gen. Zoology	3	(3,0)	Math 104 Trigonometry	2	(3,0)
and Zool 103 Gen. Zoology Lab.	1	(0,2)	Zool 101 Gen. Zoology	3	(3,0)
Ch 101 Gen. Chemistry	4	(3,3)	and Zool 103 Gen. Zoology Lab.	1	(0,2)
Engl 101 English Composition	3	(3,0)	or Bot 101 Gen. Botany	4	(3.3)
Math 103 College Algebra	2	(3,0)	Social Science Elective[†]	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			17	

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[*] Horticulture—Ornamental students take EG 101, Freehand Sketching—1 cr. (0,3), in addition to other courses in the first semester.

[†] To be selected from the following: Hist 102, Phil 201, Psych 201, Soc 201.

[For students in Biology (major in Entomology),[*] Food Science, Forestry,[†] and Pre-veterinary Medicine.]

First Semester			*Second Semester*		
Bot 101 Gen. Botany	4	(3,3)	Ag 101 Introd. to Agric.	1	(1,0)
or Zool 101 Gen. Zoology	3	(3,0)	Ch 102 Gen. Chemistry	4	(3,3)
and Zool 103 Gen. Zoology Lab.	1	(0,2)	Engl 102 English Composition	3	(3.0)
Ch 101 Gen. Chemistry	4	(3,3)	Math 106 Cal. of One Var.	4	(5,0)
Engl 101 English Composition	3	(3,0)	Zool 101 Gen. Zoology	3	(3,0)
Math 103 College Algebra	2	(3,0)	and Zool 103 Gen. Zoology Lab.	1	(0,2)
Math 104 Trigonometry	2	(3,0)	or Bot 101 Gen. Botany	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			17	

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[*] Biology students majoring in Entomology take EG 101, Freehand Sketching—1 cr. (0,3), in addition to other courses in the first semester.

[†] Forestry students take For 101, Introduction to Forestry—1 cr. (1,0), in addition to other courses in the first semester.

Forestry students take EG 105. Engineering Graphics—2 cr. (0,6), in addition to other courses in the second semester.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

The curriculum in Agricultural Economics places emphasis on a strong background in economic theory with applications to agricultural and agriculturally related businesses. Also included are courses in basic agricultural and biological sciences, liberal arts, and business. Students with a major in agricultural economics now have the opportunity to further specialize by selecting a minor in *Science, Business, International Agriculture,* or a *Second Department.*

Employment opportunities open to graduates with degrees in Agricultural Economics are many. They include research and teaching in institutions of higher learning; sales and promotional work for a variety of businesses; management positions in the farm loan departments of private banks or with cooperative farm credit agencies; public relations activities for various firms; market managers and directors; county agents; representatives of government agencies serving agriculture; and operators of numerous enterprises.

AGRICULTURAL ECONOMICS CURRICULUM

AGRICULTURAL ECONOMICS MAJOR

(See page 129 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
Ag 201 Introd. to Animal Industries	3	(2,3)	Ag Ec 202 Agric. Economics	3	(3,0)
Agron 202 Soils	3	(2,2)	Ag Ec 305 Agric. Bus. Anal.	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	or Acct 201 Prin. of Accounting	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Ag 202 Introd. to Plant Sciences	3	(2,3)
or Engl 203 Survey of Engl. Lit.[*]	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.[*]	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	or Hist 204 Hist. of Civilization	3	(3,0)
AS or MS or Elective	1		or Hist 104 Western Civilization	3	(3,0)
	17		Phys 201 Gen. Physics	3	(3,0)
			Phys 203 Gen. Physics Lab.	1	(0,3)
			AS or MS or Elective	1	
				17	

Junior Year

Ag Ec 309 Econ. of Agric. Marketing	3	(3,0)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Ag Ec 357 Natural Resource Econ.	3	(3,0)	Ag Ec 352 Public Finance	3	(3,0)
Econ 314 Intermed. Econ. Theory	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Ex St 301 Introd. Statistics	3	(2,2)	or Engl 304 Advanced Comp.	3	(3,0)
Minor[†]	6		Ex St 462 Stat. Applied to Econ.	3	(3,0)
			Minor[†]	6	
	18			18	

Senior Year

Ag Ec 405 Seminar	1	(1,0)	Ag Ec 402 Econ. of Agric. Prod.	3	(3,0)
Ag Ec 452 Agricultural Policy	3	(3,0)	Ag Ec 406 Seminar	1	(1,0)
Gen 302 Genetics	3	(2,3)	Ag Ec 456 Prices	3	(3,0)
Minor[†]	3		RS 301 Rural Sociology	3	(3,0)
Approved Electives	6		Approved Electives	6	
	16			16	

134 Total Semester Hours

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[*] At least one literature course is required.

[†] See class adviser for available minors and course requirements.

AGRICULTURAL EDUCATION[‡]

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations and agricultural extension; farming, soil conservation and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in *Business, International Agriculture,* or in a *Second Department.* Students in other departments may minor in Agricultural Education and be certified to teach.

[‡] Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

AGRICULTURAL EDUCATION CURRICULUM

AGRICULTURAL EDUCATION MAJOR

(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ag Ed 201 Introd. to Agric. Ed.	3	(2,2)	AgE 205 Farm Shop	3	(2,3)
Ag 202 Introd. to Plant Sciences	3	(2,3)	AgE 206 Agric. Mechanization	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	Ag 201 Introd. to Animal Industries	3	(2,3)
Hist 203 History of Civilization	3	(3,0)	Agron 202 Soils	3	(2,2)
or Engl 203 Survey of Engl. Lit.*	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
Phys 201 Gen. Physics	3	(3,0)	or Hist 204 Hist. of Civilization	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	or Hist 104 Western Civilization	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

AgE 301 Soil and Water Conserva.	3	(2,3)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Agron 301 Fertilizers	3	(3,0)	An Sc 301 Feeds and Feeding	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	For 307 Elem. of Forestry	3	(2,3)
Approved Horticulture Elective	3		Minor†	9	
Minor†	3			18	
Approved Electives	3				
	18				

SENIOR YEAR

Ag Ec 452 Agric. Policy	3	(3,0)	Ag Ed 401 Methods in Agric. Educ.	3	(2,2)
Ent 301 Elem. and Econ. Ent.	3	(2,3)	Ag Ed 406 Directed Teaching	6	(0,18)
Hort 407 Landscape Design	3	(2,3)	Ag Ed 422 Introd. to Adult Educ.	3	(2,2)
Pl Pa 401 Plant Pathology	3	(2,3)	Ed 302 Educ. Psychology	3	(3,0)
Minor†	3			15	
Approved Electives	3				
	18		134 Total Semester Hours		

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* At least one literature course is required.

† See class adviser for available minors and course requirements.

AGRICULTURAL ENGINEERING*

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The Agricultural Engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

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* The Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to both the Master of Science and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, and extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

AGRICULTURAL ENGINEERING CURRICULUM

AGRICULTURAL ENGINEERING MAJOR

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ag 101 Introd. to Agric.	1	(1,0)
Engr 101 Engineering Systems	0	(1,0)	Ch 102 General Chemistry	4	(3,3)
EG 109 Engr. Graph. Comm.	2	(0,6)	Engl 102 English Composition	3	(3,0)
or Humanistic—Social Elective	3	(3,0)	Humanistic—Social Elective	3	(3,0)
Engl 101 English Composition	3	(3,0)	or EG 109 Engr. Graph. Comm.	2	(0,6)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Linear Alg.	4	(5,0)
Humanistic—Social Elective	3	(3,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17 or 18			19 or 18	

Sophomore Year

AgE 221 Soil and Water Res. Engr I	3	(2,3)	AgE 212 Fund. of Mechanization	3	(2,3)
EM 201 Engr. Mech. (Statics)	3	(3,0)	Bot 101 General Botany	4	(3,3)
Engl 203 Surv. of Engl. Lit.	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Survey of Engl. and Amer. Lit.	3	(3,0)
Phys 221 Ther. and Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

Junior Year

AgE 353 Computational Systems	2	(0,6)	AgE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AgE 355 Engr. Anal. and Creat.	2	(1,3)	AgE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
EE 307 Basic Elec. Engr.	3	(3,0)	Agron 202 Soils	3	(2,2)
EM 304 Mechanics of Materials	3	(3,0)	EE 308 Basic Elec. Engr.	3	(3,0)
ME 311 Engr. Thermo. I	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Zool 101 Gen. Zoology	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Zool 103 Gen. Zoology Lab.	1	(0,2)		16	
	17				

Senior Year

AgE 431 Agric. Struct. Design	3	(2,3)	AgE 416 Agric. Machinery Design	3	(2,3)
AgE 471 Undergraduate Research	1	(0,3)	AgE 422 Soil & Water Res. Engr. II	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	AgE 442 Agric. Proc. Engr.	3	(2,3)
EM 320 Fluid Mechanics	3	(3,0)	Bot 352 Plant Physiology	4	(3,3)
Math 313 Stat. Theory and Meth. I	3	(3,0)	or Zool 307 Animal Anat. and Physiol.	3	(2,3)
Approved Electives	3		or Micro 301 Gen. Microbiology	4	(3,3)
	16		ME 304 Heat Transfer	3	(3,0)
			Approved Electives	2 or 3	
				18	

138 Total Semester Hours

ANIMAL INDUSTRIES

The Animal Industries curriculum includes three majors—Animal Science, Dairy Science, and Poultry Science.

ANIMAL SCIENCE

The Animal Science Department emphasizes subject matter dealing with the application of scientific principles to livestock production and processing.

Students will minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

Occupations for Animal Science graduates include livestock farming; cattle, swine and sheep breeding; extension livestock specialists; feed specialists; county agents; teaching and research in animal industry; positions with meat packing companies; feed dealers; freezer locker operators; livestock dealers; and livestock commission brokers.

ANIMAL INDUSTRIES CURRICULUM

ANIMAL SCIENCE MAJOR

(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chem.*	3	(3,0)	Ag 202 Introd. to Plant Sciences	3	(2,3)
Ch 227 Org. Chem. Lab.*	1	(0,3)	An Sc 201 Introd. to Animal Sc.	2	(2,0)
or Ch 220 Elem. Org. Chem.	4	(3,3)	An Sc 203 Introd. to An. Sc. Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.†	3	(3,0)
Engl 203 Survey of Engl. Lit.†	3	(3,0)	or Hist 204 Hist. of Civilization	3	(3,0)
or Hist 203 Hist. of Civilization	3	(3,0)	or Hist 104 Western Civilization	3	(3,0)
Zool 307 Animal Anat. and Phys.	3	(2,3)	Phys 201 Gen. Physics	3	(3,0)
Minor‡	3		Phys 203 Gen. Physics Lab.	1	(0,3)
AS or MS or Elective	1		Minor‡	3	
	17		AS or MS or Elective	1	
				17	

JUNIOR YEAR

An Sc 301 Feeds and Feeding	3	(3,0)	An Sc 303 Feeds and Feed. Lab.	1	(0,3)
An Sc 353 Meats	2	(2,0)	An Sc 306 Livestock Sel. & Eval.	2	(1,3)
An Sc 355 Meats Lab.	1	(0,3)	Engl 301 Public Speaking	3	(3,0)
Gen 302 Genetics	3	(2,3)	Social Science Elective§	3	(3,0)
Micro 301 Gen. Microbiology	4	(3,3)	Minor‡	6	
Approved Elective	3		Approved Elective	3	
	16			18	

SENIOR YEAR

An Sc 401 Beef Production	3	(3,0)	An Sc 406 Seminar	2	(2,0)
An Sc 403 Beef Prod. Lab.	1	(0,3)	An Sc 408 Pork Production	3	(3,0)
Dy Sc 453 Animal Reprod.	3	(3,0)	An Sc 410 Pork Prod. Lab.	1	(0,3)
Nutr 401 Fundamentals of Nut.	3	(3,0)	An Sc 452 Animal Breeding	3	(3,0)
Minor‡	3		Approved Electives	8	
Approved Electives	4			17	
	17		134 Total Semester Hours		

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* Required for Science Minor.
† At least one literature course is required.
‡ See class adviser for available minors and course requirements.
§ To be selected from the following, Hist 102 or 301, Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

DAIRY SCIENCE

The major in Dairy Science is designed to provide the student with an understanding of scientific principles and the application of these principles in the scientific, technical and business phases of the dairy industry. Completion of required studies in the sciences and humanities and selected courses by the student in areas of personal interest prepares the graduate for a successful chosen profession. A career in the dairy industry is a rewarding one, not only monetarily, but in rendering a service in providing a wholesome nutritious food for mankind.

Opportunities for dairy science graduates are many. They include the management of production and processing facilities, quality control work for processing units and production organizations, industrial promotion and public relations work in both production and processing fields, dairy and food products engineering, special services, public health service, teaching and research. Special service opportunities are available in state and national breed association work, breeding organizations, industrial supplies, production and processing equipment and supplies. Opportunities in educational activities include positions with industrial associations, state and federal services and federal programs with foreign assignments.

Students majoring in Dairy Science may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

ANIMAL INDUSTRIES CURRICULUM

DAIRY SCIENCE MAJOR

(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ag 202 Introd. to Plant Sciences	3	(2,3)	Agron 202 Soils	3	(2,2)
Ch 220 Elem. Org. Chem.	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
or Ch 223 Org. Chem.	3	(3,0)	or Hist 204 Hist. of Civilization	3	(3,0)
and Ch 227 Or. Chem. Lab.	1	(0,3)	or Hist 104 Western Civilization	3	(3,0)
Dy Sc 201 Introd. to Dairy Science	3	(2,3)	Phys 201 Gen. Physics	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Phys 203 Gen. Physics Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.*	3	(3,0)	Social Science Elective†	3	
or Hist 203 Hist. of Civilization	3	(3,0)	Minor‡	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

Dy Sc 307 Market Milk	3	(2,3)	An Sc 301 Feeds and Feeding	3	(3,0)
Fd Sc 305 Dairy and Food Engr.	3	(2,3)	Dy Sc 306 Ch. & Phys. Nat. of Milk	3	(2,3)
Fd Sc 414 Fd. Qual. Control Lab.	2	(1,3)	Gen 302 Genetics	3	(2,3)
or Dy Sc 310 Dy. Cattle Select.	1	(0,3)	Minor‡	3	
Micro 301 Gen. Microbiology	4	(3,3)	Approved Electives	4 or 5	
Minor‡	6				
	18 or 17			16 or 17	

SENIOR YEAR

Dy Sc 409 Dairy Seminar	2	(2,0)	An Sc 452 Animal Breeding	3	(3,0)
Dy Sc 453 Animal Reproduction	3	(3,0)	or Dy Sc 404 Dairy Plant Mgt.	3	(2,3)
and Dy Sc 455 Animal Reproduction Lab.	1	(0,3)	Dy Sc 410 Dairy Seminar	2	(2,0)
or Dy Sc 402 Dairy Manufac.	4	(3,3)	Dy Sc 452 Dairy Cattle Feeding and Management	3	(2,3)
Nutr 401 Fundamentals of Nut.	3	(3,0)	Micro 402 Dairy Microbiology	3	(2,3)
Minor‡	3		Approved Elective	6	
Approved Elective	5				
	17			17	

134 Total Semester Hours

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* At least one literature course is required.

† To be selected from the following: Hist 102 or 301, Pol Sc 301, Psych 201, Soc 201, Phil 201, RS 301.

‡ See class adviser for available minors and course requirements.

POULTRY SCIENCE

The Poultry Science major is expected to gain knowledge in the basic disciplines within which the poultry industry operates and specialized knowledge on the biology of the avian species. Technical poultry courses emphasize the nutrition, physiology, genetics and pathology of domesticated birds and the environmental requirements for incubation of eggs, production of meat and eggs and handling of products.

Minors in *Science, Business, Production, International Agriculture,* or a *Second Department* provide for the specialized interest of the student within the broad area encompassed by Poultry Science.

Job opportunities for Poultry Science majors who minor in *Science* include teaching, extension and research positions in colleges, government laboratories or in industry. This usually involves graduate work. *Business* minors are especially equipped to move into management positions in the small to large corporations in feed manufacturing, production, processing, and marketing of poultry products. *Production* minors are trained for operation of poultry farms, general farms, or as extension agents working with farmers. *International Agriculture* minors are expected to export the technical information and techniques so successful in the American poultry industry to a protein-short world. Many American poultry firms are operating on a worldwide basis and our own government and foreign nations are interested in assistance in transferring poultry knowledge to underdeveloped areas.

Students who hope to work in broad agricultural areas that include poultry and other agricultural segments may find a minor in a *Second Department* helpful. This includes such opportunities as agricultural chemicals, pharmaceuticals, biologicals, feed manufacturers, breeding organizations, marketing organizations, publishers, advertisers, and poultry farmers involved in another enterprise.

ANIMAL INDUSTRIES CURRICULUM

POULTRY SCIENCE MAJOR

(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ag 202 Introd. to Plant Sciences	3	(2,3)	Econ 201 Principles of Econ.	3	(3,0)
Ch 220 Elem. Org. Chem.*	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.†	3	(3,0)
Engl 203 Survey of Engl. Lit.†	3	(3,0)	or Hist 204 Hist. of Civilization	3	(3,0)
or Hist 203 Hist. of Civilization	3	(3,0)	or Hist 104 Western Civilization	3	(3,0)
Gen 302 Genetics	3	(2,3)	Micro 301 Gen. Microbiology	4	(3,3)
PS 201 Introd. to Poultry Science	3	(2,3)	Phys 201 Gen. Physics	3	(3,0)
AS or MS or Elective	1		Phys 203 Gen. Physics Lab.	1	(0,3)
	17		PS 356 Incub. and Brooding	2	(2,0)
			PS 358 Incub. and Brooding Lab.	1	(0,3)
			AS or MS or Elective	1	
				18	

JUNIOR YEAR

First Semester			*Second Semester*		
An Sc 301 Feeds and Feeding	3	(3,0)	PS 354 Poultry Breeding	3	(2,3)
Engl 301 Public Speaking	3	(3,0)	PS 451 Poultry Nutrition	2	(2,0)
PS 355 Poult. Prod. Grad. & Tech.	3	(2,3)	Dept. Major Requirement¶	3	
Zool 307 Animal Anat. & Physiol.	3	(2,3)	Minor§	6	
Social Science Elective‡	3		Approved Elective	3	
Minor§	3			17	
	18				

SENIOR YEAR

First Semester			*Second Semester*		
PS 401 Animal Environ. Tech.	2	(2,0)	PS 458 Avian Microbiology and Parasit.	4	(3,3)
PS 403 Ani. Environ. Tech. Lab.	1	(0,3)	Dept. Major Requirement¶	3 or 2	
PS 460 Seminar	2	(2,0)	Minor§	3	
Dept. Major Requirement¶	3		Approved Electives	5 or 6	
Minor§	3			15	
Approved Electives	6				
	17				

134 Total Semester Hours

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* Science minors should substitute Ch 223, 227 for Ch 220. Business minors may substitute Acct 201.

† At least one literature course is required.

‡ To be selected from the following: Hist 301 or 102, Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

§ See class adviser for available minors and course requirements.

¶ See class adviser for department major requirements.

BIOLOGY (Entomology Major)

The Entomology major in the Biology curriculum is described below. See pages 144-148 for other majors in the Biology curriculum.

ENTOMOLOGY

Entomology is that branch of science that deals with the study of insects. In many ways insects are the most important group of animals that affect man. At the present time insects are costing the American public approximately four billion dollars annually. There will always be a need for qualified entomologists and the financial rewards to members of this profession are comparable to those enjoyed by most other scientists.

Depending on training, ability, and interest, entomologists find employment in such areas as the following: (1) research entomologist with several federal agencies, the state experiment stations, or private research foundations; (2) teaching entomology and/or zoology at the college or university level; (3) industrial research and the development of more efficient insecticides; (4) quarantine and regulatory work at both state and federal levels; (5) sales and management for agricultural chemical or the pest control industries; (6) the federal and state extension services; (7) many other specialized areas where a knowledge of insects is essential, such as beekeeping or disease transmission.

BIOLOGY CURRICULUM

ENTOMOLOGY MAJOR

(See page 129 for *Freshman Year* and page 145 for *Sophomore Year*)

JUNIOR YEAR

First Semester			*Second Semester*		
Ent 401 Field Cr., St. Prdo. Insects	3	(2,3)	Ent 402 Fruit, Nut, Veg. Insects	3	(2,3)
Phys 201 Gen. Physics	3	(3,0)	Micro 301 Gen. Microbiology	4	(3,3)
Phys 203 Gen. Physics Lab.	1	(0,3)	Phys 202 Gen. Physics	3	(3,0)
Social Science Elective*	3	(3,0)	Phys 204 Gen. Phys. Lab.	1	(0,3)
Approved Electives†	6		Approved Electives†	6	
	16			17	

SENIOR YEAR

Engl 301 Public Speaking	3	(3,0)	Ent 410 Insect Taxonomy	3	(1,6)
Ent 405 Insect Morphology	4	(3,3)	Ent 462 Seminar	1	(1,0)
Ent 461 Seminar	1	(1,0)	Gen 302 Genetics	3	(2,3)
Pl Pa 401 Plant Pathology	3	(2,3)	Zool 460 Gen. Physiology	3	(2,3)
Zool 304 Animal Ecology	3	(2,3)	Social Science Elective*	3	
Approved Electives†	4		Approved Elective†	5	
	18			18	
			135 Total Semester Hours		

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* To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102 or 301, Hist 104, 203, 204, Phil 201, 302, Pol Sc 201, 202, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

† Agron 202 must be included.

FOOD SCIENCE

The Food Science curriculum is designed to prepare students for the many career opportunities in technical and management areas of the food industry. The food industry, being the nation's largest industry, is becoming increasingly technical and requires large numbers of professional food scientists. World food supplies, particularly those rich in protein, are becoming increasingly critical in many parts of the globe. This situation is expected to accelerate the demand for food scientists.

Opportunities for graduates in Food Science include research positions in government organizations and state experiment stations, supervisory, administrative, research, and quality control positions in food processing industries, inspection and grading work with state and federal agencies, consulting, and teaching and extension activities with universities and colleges. Students graduating in Food Science are well-prepared to pursue postgraduate training in areas such as microbiology, biochemistry, nutrition, as well as in Food Science.

The student majoring in Food Science will select a minor in *Science, Business, International Agriculture,* or a *Second Department* which will emphasize training in an area other than Food Science and which is designed to supplement the major course of study.

FOOD SCIENCE CURRICULUM

FOOD SCIENCE MAJOR

(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chem.	3	(3,0)	Ch 224 Org. Chem.	3	(3,0)
Ch 227 Org. Chem. Lab.	1	(0,3)	Ch 228 Org. Chem. Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	or Ch 313 Quantitative Analysis	3	(3,0)
Engl 203 Survey of Engl. Lit.[*]	3	(3,0)	and Ch 317 Quant. Anal. Lab.	1	(0,3)
or Hist 203 Hist. of Civilization	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.[*]	3	(3,0)
Phys 201 Gen. Physics	3	(3,0)	or Hist 204 Hist. of Civilization	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	or Hist 104 Western Civilization	3	(3,0)
Social Science Elective[†]	3		Fd Sc 212 Man's Food Resources	2	(2,0)
AS or MS or Elective	1		Phys 202 Gen. Physics	3	(3,0)
			Phys 204 Gen. Physics Lab.	1	(0,3)
			Social Science Elective[†]	3	
			AS or MS or Elective	1	
	18			17	

JUNIOR YEAR

Fd Sc 305 Dairy and Food Engr.	3	(2,3)	Ch 310 Elem. Biochemistry	4	(3,3)
Fd Sc 311 Food Processing	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Fd Sc 313 Food Processing Lab.	1	(0,3)	Fd Sc 312 Food Processing	3	(3,0)
Micro 301 Gen. Microbiology	4	(3,3)	Fd Sc 314 Food Process. Lab.	1	(0,3)
Minor[‡]	3		Micro 404 Food Microbiology	3	(2,3)
Approved Elective	2		Minor[‡]	3	
	16			17	

SENIOR YEAR

Ex St 301 Introd. Statistics	3	(2,2)	Fd Sc 412 Food Quality Control	2	(2,0)
Fd Sc 413 Biochem. of Foods	2	(2,0)	Fd Sc 414 Food Qual. Con. Lab.	2	(1,3)
Fd Sc 415 Human Nutrition	2	(2,0)	Fd Sc 416 Food Analysis	2	(1,3)
Minor[‡]	6		Fd Sc 418 Seminar	1	(1,0)
Approved Electives	4		Minor[‡]	3	
			Approved Electives	6	
	17			16	

134 Total Semester Hours

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[*] At least one literature course is required.

[†] To be selected from the following: Hist 102 or 301, Soc 201, Phil 201, Pol Sc 301, Psych 201, RS 301.

[‡] See class adviser for available minors and course requirements.

FORESTRY

The Clemson Forestry curriculum includes the fundamental and applied sciences needed in the scientific management of multiple-use forests. Foresters of professional standing are employed in various capacities by private concerns and by federal, state, and other public agencies. They may be engaged as managers and administrators of forest lands, technical specialists in extension, fire protection, recreation, or in other activities presupposing professional forestry knowledge. Foresters earning advanced degrees find employment in academic work and in research conducted both by public and private agencies.

FORESTRY CURRICULUM

FORESTRY MAJOR

(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agron 202 Soils	3	(2,2)	Bot 356 Taxonomy	3	(1,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	CE 201 Surveying	3	(2,3)
For 205 Dendrology	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.	3	(3,0)
Math 205 Cal and Linear Alg.	4	(5,0)	For 206 Silvics	2	(2,0)
Phys 201 Gen. Physics	3	(3,0)	Geol 201 Physical Geol.	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	Phys 202 Gen. Physics	3	(3,0)
AS or MS or Elective	1		Phys 204 Gen. Physics Lab.	1	(0,3)
			AS or MS or Elective	1	
	19			19	

FORESTRY SUMMER CAMP [°]

For 251S	Silvics	2 cr.
For 252S	Forest Engineering	2 cr.
For 253S	Dendrometry	4 cr.
For 254S	Forest Products	1 cr.

JUNIOR YEAR

Bot 352 Plant Physiology	4	(3,3)	For 302 Dendrometry	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	For 304 Forest Economics	3	(3,0)
Ent 307 Forest Entomology	3	(2,3)	For 306 Ident. of Wood and Wood Fibers	1	(0,3)
Ex St 301 Introd Statistics	3	(2,2)	For 308 Aerial Photos in For.	3	(2,3)
WB 412 Wildlife Management	3	(2,3)	For 310 Silviculture	4	(3,3)
Approved Electives[†]	3		Approved Electives[†]	3	
	19			17	

SENIOR YEAR

For 401 Logging and Milling	4	(2,6)	Engl 301 Public Speaking	3	(3,0)
For 407 Forest Regulation	4	(3,3)	For 404 Managament Plans	1	(0,3)
Pl Pa 405 Forest Pathology	3	(2,3)	For 406 For. Policy and Admin.	2	(2,0)
Pol Sc 301 Am. Gov. and Pol. Par.	3	(3,0)	For 408 Forest Valuation	3	(3,0)
Approved Electives[†]	3		For 410 Forest Prod.	3	(2,3)
			For 412 Forest Protection	2	(2,0)
			Approved Electives[†]	3	
	17			17	

153 Total Semester Hours

[°] Students planning to eat in the University Dining Halls are advised to purchase individual meals rather than board plans *during summer camp,* because several days of travel away from campus can be anticipated during which students will be responsible for their own meals and lodging.

[†] At least three credits must be selected from the following courses: Hist 102, or 301, Phil 201, Psych 201, RS 301, Soc 201.

PLANT SCIENCES

The Plant Sciences curriculum includes three majors—Agronomy—Crops and Soils, Horticulture (Fruit and Vegetable), and Horticulture (Ornamental).

AGRONOMY—CROPS AND SOILS

Agronomy encompasses the natural and physical sciences involved in the production of crops that are used to feed and clothe the world's population. Agronomy students may specialize in the sciences relating to field crops and soils. Trained agronomists may choose an occupation that ranges from the applied (farming) to the abstract (basic research). Agronomists may be employed by the Agricultural Extension Service, the Soil Conservation Service, and the Agricultural Research Service. In addition, agronomists may find employment in college and high school teaching in foreign service work, and in the many allied industries in agriculture.

Students majoring in Agronomy—Crops and Soils will declare a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

AGRONOMY—CROPS AND SOILS MAJOR
(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ag 202 Introd. to Plant Sciences	3	(2,3)	Ag 201 Introd. to Animal Industries	3	(2,3)
Ch 220 Elem. Org. Chem.	4	(3,3)	Agron 202 Soils	3	(2,2)
or Ch 223 Org. Chem.	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
and Ch 227 Org. Chem. Lab.	1	(0,3)	or Hist 204 Hist. of Civilization	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	or Hist 104 Western Civilization	3	(3,0)
Engl 203 Survey of Engl. Lit.*	3	(3,0)	Minor†	6	
or Hist 203 Hist. of Civilization	3	(3,0)	AS or MS or Elective	1	
Phys 201 Gen. Physics	3	(3,0)			
Phys 203 Gen. Physics Lab.	1	(0,3)			
AS or MS or Elective	1				
	18			16	

JUNIOR YEAR

Agron 301 Fertilizers‡	3	(3,0)	Agron 308 Soil and Plant Anal.	3	(1,6)
Agron 410 Cotton and Other Fiber Crops‡	2	(2,0)	Agron 310 Forage & Pas. Crops‡	3	(3,0)
or Agron 411 Grain Crops	2	(2,0)	Agron 312 Forage Crops Lab.‡	1	(0,2)
or Agron 412 Tobacco and Spec. Use Crops	2	(2,0)	Agron 410 Cotton and Other Fiber Crops‡	2	(2,0)
Bot 352 Plant Physiology	4	(3,3)	or Agron 411 Grain Crops	2	(2,0)
Gen 302 Genetics	3	(2,3)	or Agron 412 Tobacco and Spec. Use Crops	2	(2,0)
Micro 301 Gen. Microbiology	4	(3,3)	Social Science Elective§	3	
			Minor†	6	
	16			18	

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* At least one literature course is required.

† See class adviser for available minors and course requirements.

‡ Required for all students except science minors. Science minors select 13 credits from three courses.

§ To be selected from the following: Hist 102 or 301, Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

SENIOR YEAR

First Semester		*Second Semester*	
Agron 403 Soil Genesis and Classification‡	2 (1,3)	Agron 405 Plant Breeding‡	3 (2,2)
Agron 407 Prin. of Weed Control‡	3 (2,2)	or Micro 410 Soil Microbiology	3 (2,3)
Agron 455 Seminar	1 (1,0)	Agron 452 Soil Fert. and Mgt.‡	2 (2,0)
Minor¶	3 — 7	Agron 456 Seminar	1 (1,0)
Approvtd Electives	7	Approved Electives¶	12 — 8
	16 — 20		18 — 14
		134 Total Semester Hours	

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‡ Required for all students except science minors. Science minors select 13 credits from three courses.

¶ Credit requirements depend upon minor.

HORTICULTURE (Fruit and Vegetable)

This major provides the student with a basic education in science and the humanities, and the application of both in the scientific, technical, and business phases of the fruit and vegetable industry.

Opportunities in this field of study include vegetable and fruit farm management; inspection of fresh fruit, vegetable and other food products as well as nursery stock. There are many other opportunities as in plant breeding, agricultural extension service work, horticultural research, horticultural teaching and writing, and fruit and vegetable processing. Other occupations include sales and field work with seedsmen and nurserymen, and manufacturers of food, fertilizer, and pesticide products.

Students majoring in the fruit and vegetable phase of Horticulture may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

HORTICULTURE (FRUIT AND VEGETABLE) MAJOR
(See page 129 for *Freshman Year*)

SOPHOMORE YEAR

First Semester		*Second Semester*	
Agron 202 Soils	3 (2,2)	Ag 201 Introd. to Animal Industries	3 (2,3)
Ch 220 Elem. Org. Chem.	4 (3,3)	Engl 204 Survey of Engl. and Amer. Lit.*	3 (3,0)
Econ 201 Principles of Econ.	3 (3,0)	or Hist 204 Hist. of Civilization	3 (3,0)
Engl 203 Survey of Engl. Lit.*	3 (3,0)	or Hist 104 Western Civilization	3 (3,0)
or Hist 203 Hist. of Civilization	3 (3,0)	Ent 301 Elem. and Econ. Ent.	3 (2,3)
Hort 201 Gen. Horticulture	3 (2,2)	Phys 201 Gen. Physics	3 (3,0)
AS or MS or Elective	1	Phys 203 Gen. Physics Lab.	1 (0,3)
	17	Approved Electives	3
		AS or MS or Elective	1
			17

JUNIOR YEAR

Gen 302 Genetics	3 (2,3)	Bot 352 Plant Physiology	4 (3,3)
Hort 305 Plant Propagation	3 (2,3)	Hort 302 Prin. Veg. Prod.	3 (2,3)
Hort 352 Commercial Pomology	3 (2,3)	Hort 451 Small Fruit Culture	3 (2,3)
Social Science Elective†	3	Micro 301 Gen. Microbiology	4 (3,3)
Minor‡	3	Minor‡	3
Approved Electives	3		17
	18		

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* At least one literature course is required.

† To be selected from the following, Hist 102 or 301, Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

‡ See class adviser for available minors and course requirements.

Senior Year

First Semester

Hort 405 Nut Tree Culture	2	(2,0)
Hort 407 Landscape Design	3	(2,3)
Hort 409 Seminar	1	(1,0)
Hort 464 Post-Harvest Hort.	3	(2,3)
Pl Pa 401 Plant Pathology	3	(2,3)
Minor‡	3	
Approved Electives	3	
	18	

Second Semester

Hort 410 Seminar	1	(1,0)
Hort 456 Vegetable Crops	3	(3,0)
Minor‡	6	
Approved Electives	5	
	15	

134 Total Semester Hours

HORTICULTURE (Ornamental)

This major is designed to give students a scientific background and technical facilities in the field of Ornamental Horticulture. Subject matter covers plant materials culture, uses, and planning of ground spaces.

Graduates find careers in nursery work, floriculture, landscape designing, landscape contracting, turf management, and park supervision. Other occupations are as research personnel, teachers, extension workers, and as representatives of fertilizer, machinery, and chemical companies.

Students desiring to major in Ornamental Horticulture may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

HORTICULTURE (ORNAMENTAL) MAJOR

(See page 129 for *Freshman Year*)

Sophomore Year

First Semester

Agron 202 Soils	3	(2,2)
Ch 220 Elem. Org. Chem.	4	(3,3)
Econ 201 Principles of Econ.	3	(3,0)
Engl 203 Survey of Engl. Lit.*	3	(3,0)
or Hist 203 Hist. of Civilization	3	(3,0)
Hort 201 Gen. Horticulture	3	(2,2)
AS or MS or Elective	1	
	17	

Second Semester

Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
or Hist 204 Hist. of Civilization	3	(3,0)
or Hist 104 Western Civilization	3	(3,0)
Ent 301 Elem. and Econ. Ent.	3	(2,3)
Phys 201 Gen. Physics	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)
Approved Electives	5	
AS or MS or Elective	1	
	16	

Junior Year

Bot 352 Plant Physiology	4	(3,3)
Gen 302 Genetics	3	(2,3)
Hort 303 Plant Materials I	3	(2,2)
Hort 305 Plant Propagation	3	(2,3)
Social Science Elective†	3	
	16	

Hort 304 Plant Materials II	3	(2,3)
Hort 308 Landscape Design	3	(2,3)
Hort 310 Floriculture	3	(2,2)
Minor‡	6	
Approved Electives	3	
	18	

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* At least one literature course is required.

† To be selected from the following: Hist 102 or 301, Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

‡ See class adviser for available minors and course requirements.

SENIOR YEAR

First Semester			*Second Semester*		
Hort 408 Floral Design and Retail Marketing	3	(2,2)	Hort 406 Nursery Technology	3	(2,3)
Hort 409 Seminar	1	(1,0)	Hort 410 Seminar	1	(1,0)
Hort 412 Turf Management	3	(2,3)	Pl Pa 401 Plant Pathology	3	(2,3)
Hort 460 Prob. in Landscape Des.	5	(3,6)	Minor‡	6	
Minor‡	3		Approved Electives	3	
Approved Electives	3			16	
	18				

134 Total Semester Hours

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‡ See class adviser for available minors and course requirements.

PRE-VETERINARY MEDICINE

The curriculum in Pre-veterinary Medicine is designed to meet the general requirements for admission to certain schools of veterinary medicine. Since the requirements for entrance to these schools are not uniform, the student in planning his program should consider the specific requirements of the school he expects to attend. Under the Southern Regional Educational Plan, ten qualified students from South Carolina may enter the School of Veterinary Medicine at the University of Georgia each year. The courses listed below are minimum requirements for all students applying under the Regional Education Board Contract. Only the exceptional student can expect to complete the minimum requirements in four semesters. Students in the entering classes in Schools of Veterinary Medicine now average in excess of three years of Pre-veterinary training.

PRE-VETERINARY MEDICINE CURRICULUM

(See page 129 for *Freshman Year*)

An Sc 201 Introd. to Animal Sc.	2	(2,0)
An Sc 203 Introd. to A. Sci. Lab.	1	(0,3)
An Sc 301 Feeds and Feeding	3	(3,0)
Ch 223 Org. Chemistry	3	(3,0)
Ch 224 Org. Chemistry	3	(3,0)
Ch 227 Org Chemistry Lab.	1	(0,3)
Ch 228 Org. Chemistry Lab.	1	(0,3)
Dy Sc 201 Introd. to Dairy Science	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)
Engl 203 Surv. of Engl. Lit.	3	(3,0)
Gen 302 Genetics	3	(2,3)
Phys 201 Gen. Physics	3	(3,0)
Phys 202 Gen. Physics	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)
Phys 204 Gen. Physics Lab.	1	(0,3)
Pol Sc 301 American Gov. and Pol. Par.	3	(3,0)
PS 201 Introd. to Poultry Science	3	(2,3)
Zool 301 Comp. Vet. Anat.	3	(2,3)
AS or MS or Elective	2	
	45	

78 Total Semester Hours

DIVISION OF BIOLOGY

The biological sciences are concerned with understanding the phenomenon of life, its origin and development, its morphology and classification, its mechanisms and regulations and its procreation and demise. Biology, without question, is relevant to the student in the 1970's, for it assists him in understanding not only himself but all forms of life that are around him.

Academic sections within the Division of Biology offer courses stressing the fundamental structure and unity of life as well as the interrelationships between all components of nature.

Thus, with the fundamentals well established, the developing biologist may choose to complete his undergraduate training in the majors of Botany, Entomology,[††] Microbiology, and Zoology. The curriculum in any one of the four areas will introduce to the student the classical biology or morphology and classification as well as modern biology which seeks to understand the physiochemical bases of the phenomenon of life. Overspecialization will be avoided and instead the choice of subjects will attempt to provide the basic knowledge needed by each student in his chosen career.

Upon the completion of his undergraduate program, the student may choose to become employed in his area of interest or continue his education. If the latter is chosen he should be equipped to enter a professional school, such as a medical college, continue in a graduate biology curriculum; or a graduate program in one of the associated areas, such as bioengineering, biochemistry, biophysics, biomathematics, or one of the areas of agriculture, such as plant or animal breeding, plant pathology, entomology and plant or animal physiology.

[††] See page 138 for Entomology Major.

FRESHMAN AND SOPHOMORE YEAR CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Bot 101 Gen. Botany	4	(3,3)	Ch 102 Gen. Chemistry	4	(3,3)
or Zool 101 Gen. Zoology	3	(3,0)	Engl 102 English Composition	3	(3,0)
and Zool 103 Gen. Zoology Lab.	1	(0,2)	Math 106 Cal. of One Var.	4	(5,0)
Ch 101 Gen. Chemistry	4	(3,3)	Zool 101 Gen. Zoology	3	(3,0)
EG 101 Freehand Sketching	1	(0,3)	and Zool 103 Gen. Zoology Lab.	1	(0,2)
Engl 101 English Composition	3	(3,0)	or Bot 101 Gen. Botany	4	(3,3)
Math 103 College Algebra	2	(3,0)	AS or MS or Elective	1	
Math 104 Trigonometry	2	(3,0)			
AS or MS or Elective	1			16	
	17				

Sophomore Year

Econ 201 Principles of Econ.	3	(3,0)	Bot 202 Surv. of Pl. Kingdom[*]	4	(3,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.	3	(3,0)
Zool 201 Invertebrate Zool.[*]	4	(3,3)	Chemistry Elective[‡]	4	
Chemistry Elective[†]	4		Social Science Elective[§]	3	
AS or MS or Elective	1		Approved Electives[¶]	4	
	15		AS or MS or Elective	1	
				19	

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[*] Entomology majors substitute Ag 201 for Zool 201 and Ag 202 for Bot 202.

[†] Ch 220 or Ch 223 and 227. Botany majors substitute Phys 201 and 203 for Chemistry Elective.

[‡] Ch 224 and 228, Ch 310, or Ch 313 and 317. Botany majors substitute Phys 202 and 204 for Chemistry Elective.

[§] To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102 of 301, Hist 104, 203, 204, Phil 201, 302, Pol Sc 201, 202, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 301.

[¶] Students enrolled in the Entomology major must select Ent 301 and students enrolled in the Microbiology major must select Micro 301.

BOTANY

Botany is that portion of Biology dealing with plants, their structure, classification, growth, and development. The Botany major is designed to prepare students for employment as biologists in sales, service, or research in industry or government service. It also provides the background in the fundamental physical and biological sciences necessary for graduate study in the basic and many of the applied plant sciences. Adequate electives are provided so that a student may take additional courses in the area or areas of his special interest.

BIOLOGY CURRICULUM

BOTANY MAJOR

(See page 145 for *Freshman* and *Sophomore Years*)

JUNIOR YEAR

First Semester			*Second Semester*		
Bot 352 Plant Pathology	4	(3,3)	Bot 356 Plant Taxonomy	3	(1,6)
Micro 301 Gen. Microbiology	4	(3,3)	Engl 301 Public Speaking	3	(3,0)
Chemistry Elective*	4		Chemistry Elective†	4	
Approved Elective§	6		Approved Electives§	6	
	18			16	

SENIOR YEAR

First Semester			*Second Semester*		
Bot 406 Plant Anatomy	3	(2,3)	Bot 452 Plant Ecology	3	(3,0)
Gen 302 Genetics	3	(2,3)	Social Science Elective‡	3	(3,0)
Social Science Elective‡	3	(3,0)	Approved Electives§	10	
Approved Elective§	8				
	17			16	

134 Total Semester Hours

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* Ch 220 or 223 and 227.

† Ch 224 and 228, Ch 310, or Ch 313 and 317.

‡ To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102 or 301, Hist 104, 203, 204, Phil 201, 302, Pol Sc 201, 202, 301, 302, Psych 201, Rel 301, RS 301, Soc 201.

§ Select 9 credits from the following: Agron 405, Bot 404, 457, Gen 451, Micro 401, Pl Pa 401, 405, 456, 458, Zool 458.

MICROBIOLOGY

Microbiology is that discipline of biology concerned with the study of microscopic and sub-microscopic forms of life, which include the bacteria, viruses, yeasts, fungi, protozoa and unicellular algae. The microbiologist seeks to describe these minute life forms in terms of their structures, functions, and processes of reproduction, growth and death at both the cellular and molecular levels. He is also concerned with their interactions and interrelationships with both their animate and inanimate environments, and also with their economic importance to man. To accomplish these goals the microbiologist must be trained in the areas of mathematics, physics, chemistry, and biochemistry in addition to those of microbiology.

The microbiology major offers courses to cover all the areas mentioned above, so that a student graduating from this program is prepared either for entrance to graduate school in the fields of microbiology, biochemistry or bioengineering, or to pursue a career in one of the many industries or public service departments dependent upon microbiology, *e. g.*, the fermentation and drug industries, agriculture, various food industries, medical and public health microbiology.

BIOLOGY CURRICULUM

MICROBIOLOGY MAJOR
(See page 145 for *Freshman* and *Sophomore Years*)

JUNIOR YEAR

First Semester			*Second Semester*		
Engl 301 Public Speaking	3	(3,0)	Gen 302 Genetics	3	(2,3)
Micro 401 Adv. Microbiology	4	(2,6)	Micro 412 Bact. Physiology	4	(3,3)
Phys 201 Gen. Physics	3	(3,0)	Phys 202 Gen. Physics	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	Phys 204 Gen. Physics Lab.	1	(0,3)
Approved Electives[*]	6		Approved Electives[*]	6	
	17			17	

SENIOR YEAR

Social Science Elective[†]	3	(3,0)	Micro 411 Pathogenic Bact.	3	(2,3)
Approved Elective[*]	14		Social Science Elective[†]	3	(3,0)
			Approved Electives[*]	10	
	17			16	

134 Total Semester Hours

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[*] Select 12 credits from the following: Bot 451, Micro 402, 404, 410, Pl Pa 456, PS 458, Zool 456.

[†] To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102 or 301, Hist 104, 203, 204, Phil 201, 302, Pol Sc 201, 202, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

ZOOLOGY

Zoology is that aspect of biology which attempts to describe, classify and explore all facets of animal life. The examination of this life would extend from the broad view of the ecologists to the ultra-structural view of the electron microscopists. Of equal importance will be the discussion of historical concepts which have shaped the study of zoology in the past and those of recent origin which characterize modern biology.

The major in Zoology therefore will provide thorough coverage of the fundamentals of zoology, drawing when necessary on the chemical, physical and mathematical as well as philosophical disciplines. The zoology program combines laboratory as well as field exercises in the treatment of vertebrate and invertebrate animals with elective hours available for developing further specific interest areas. On the completion of this major the student should be prepared to continue in graduate studies in several zoological disciplines, enter a medical or dental college, enter the business community in sales or service or serve with a federal or state agency.

BIOLOGY CURRICULUM

ZOOLOGY MAJOR

(See page 145 for *Freshman* and *Sophomore Years*)

JUNIOR YEAR

First Semester			*Second Semester*		
Ent 301 Elem. and Econ. Ent.	3	(2,3)	Micro 301 Gen. Microbiology	4	(3,3)
Phys 201 Gen. Physics	3	(3,0)	Phys 202 Gen. Physics	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	Phys 204 Gen. Physics Lab.	1	(0,3)
Zool 301 Comp. Vert. Anat.	3	(2,3)	Zool 302 Vert. Embryology	3	(2,3)
Social Science Elective*	3		Social Science Elective*	3	
Approved Electives†	3		Approved Elective†	3	
	16			17	

SENIOR YEAR

Engl 301 Public Speaking	3	(3,0)	Gen 302 Genetics	3	(2,3)
Zool 304 Ecology	3	(2,3)	Zool 460 Gen. Physiology	3	(2,3)
Approved Electives†	11		Approved Electives†	11	
	17			17	

134 Total Semester Hours

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* To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102 or 301, Hist 104, 203, 204, Phil 201, 302, Pol Sc 201, 202, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

† Select 6 credits from the following: Bot 404, Ent 405, 408, 455, 461, 462, 468, WB 412, Zool 403, 404, 405, 410, 456, 458, 461.

COLLEGE OF ARCHITECTURE

The Clemson University College of Architecture provides coordinated pre-professional and professional degree programs at undergraduate and graduate levels in preparation for careers in: Architecture, City and Regional Planning and Building Construction. These curriculums are not offered elsewhere in the state. The pre-professional offerings of the College also provide an excellent basis for subsequent graduate studies in Landscape Architecture, Art and Architectural History, Painting and Sculpture.

In addition to the courses and curriculums structured for the professional students of the College, cultural offerings in both lecture and studio courses are available to the general student population and required in certain other schools and colleges.

A rich annual series of exhibitions in the Rudolph Lee Gallery of the College and lectures by figures of international importance in the environmental arts and sciences are presented by the Clemson Architectural Foundation and open to the public. An unusual bond has existed between the architects of the state and region and the College since the first offering of architectural courses to a few students in 1914. The South Carolina Chapter of the American Institute of Architects in 1955 asked that a strong school be established and pledged its continuing unified support of school programs as the prime project of the organization. Sweeping administrative and curricular changes brought a five-year curriculum and full accreditation that year. Following three years of rapid development the College was made an autonomous professional school by action of the Board of Trustees in 1958.

During the decade just ending, the College has sought to select its students with increasing care and to broaden and strengthen its offerings and its faculty. As might be expected, the curriculums and objectives are under continuing study.

To better prepare professional students a two-degree six-year program is required for those majoring in architecture beginning with the entering class of the academic year 1967-68.

The College enjoys contracts for creative research in several areas, and receives an annual support budget from the Clemson Architectural Foundation to enrich its program. It is a member of the Association of Collegiate Schools of Architecture, the Associated Schools of Construction, collaborates with the South Carolina Chapter of the American Institute of Planners, and is accredited by the National Architectural Accrediting Board.

The Architectural Foundation is a nonprofit corporation established in January 1956 under the Laws of the State of South Carolina and under the sponsorship of the South Carolina Chapter of the American Institute of Architects. It was established to facilitate the continuous improvement of architectural education and of the art and technology of building in South Carolina by providing financial and other assistance to the College of Architecture at Clemson University. By this means students in the College of Architecture at Clemson have been able to enjoy instruction, facilities, and conditions equal to those normally found at the nation's best universities.

The advantages to the student evolving from the Clemson Architectural Foundation are many. Among them are the programs of celebrated guest critics and lecturers, excellent exhibits of many types—paintings, sculpture, architecture, construction, furniture, ceramics, textiles and other allied arts and crafts—traveling expenses for student field trips and professional activities, and student loans and grants. Visual-aid facilities and gifts to the library are examples of permanent assets provided through Foundation support.

Intangible but important is the sense of unity and of high purpose resulting from the activities of the Clemson Architectural Foundation which now permeates the entire architectural scene in South Carolina: the architects, their friends in the building industry and the faculty of the College.

The College of Architecture is housed in a modern building constructed for its program in 1958. Space nevertheless is limited and enrollment restricted to students with capacity and motivation. A major addition to the building is projected for early construction. At present the requisite functions are provided on two levels arranged around a central landscaped court. Design studios and the library occupy the entire second level. The first level accommodates the auditorium, classrooms, graduate studios, two art studios, the Exhibition Gallery, and administrative and faculty offices. A ground floor houses shops, photo laboratory, and sculpture studio, jury room and gallery preparations and storage. All areas are air-conditioned.

ENTRANCE REQUIREMENTS

In the interest of both students and the conservation of University resources and to maintain a program on the highest level, admission to the College of Architecture must necessarily be on a selective basis. Annual enrollment quotas are established consistent with space available. Selection considerations include secondary school record and performances in the College Board examination (SAT Test). A personal interview with the Dean should be arranged by the applicant as early as possible in the year before admission.

Applicants are required to take the Architectural Aptitude Examination as administered by the Educational Testing Service of Princeton, and although these are not used as criterion for admission, the results are helpful to both the applicant and the admission committee.

Applications for the Aptitude Examination may be obtained from the Educational Testing Service, Princeton, New Jersey 20933. This test is administered at Clemson and other regional testing centers in October, January, and March.

Students wishing admission are advised to make application to the University early in the fall or winter of their senior year in high school and to make arrangements for a personal interview with the Dean of the College as soon as possible. The admissions council of the College will further interview all entering students during freshman matriculation week of each academic year.

THE PROGRAMS OF STUDY

ARCHITECTURE

The architect as a practicing professional has the creative responsibility of designing the buildings which shape our physical environment. To understand the humanistic, economic and technological nature of environmental problems, he must have a sound general education. This professional education must prepare him for a life of continuing change, in which problems to be solved will be large and small, for every sort of function, in every type of climate and for every condition of budget.

The curriculum in architecture is six years in length embracing a four-year Bachelor of Arts in Pre-architecture sequence with a balance of general education and professional study followed by two intensive years of graduate work leading to the first professional degree, Master of Architecture.

BUILDING CONSTRUCTION

The nation's leading industry in terms of annual dollar volume is Building Construction. Building contracting is a dynamic field and although organizations vary considerably in type, size and complexity, those in leadership positions must invariably have capability (education) in management, construction science, relevant technical disciplines, and the humanities. The curriculum in Building Construction has been structured to provide young people with the unique balance of studies needed to equip them for key roles in the industry. There is a tremendous demand for graduates of the curriculum. The course is four years in length and leads to the Bachelor of Science degree in Building Construction.

CITY AND REGIONAL PLANNING

The City Planner is a member of an essential and complex profession concerned with the programming and guilding of urban and regional development. Our expanding society presents unusual opportunities for Planning graduates in private firms and on public agency staffs. When asked what made a good planner, a leading British professional replied, "A sensitive, creative leader who has lived a bit." He must be able to integrate recommendations of a wide range of specialists. The sociologist, economist, traffic engineer and ecologist, plays significant roles in urban growth and change, but the city planner and urban designer must bring the city to physical form with balance and imagination.

Students admitted as candidates for the Master of City and Regional Planning degree must have the following qualifications:

(a) Meet the admissions requirements for the University Graduate School.

(b) Have a baccalaureate degree approved by the school in such fields as: architecture, civil engineering, economics, landscape architecture, law, political science, or sociology.

Candidates entering the curriculum from a non-design discipline will be required to take a special parallel course designed for their needs, and accordingly may be excused from courses in which they have achieved proficiency.

ARCHITECTURE CURRICULUM

BACHELOR OF ARTS IN PRE-ARCHITECTURE

First Year

First Semester		*Second Semester*	
Arch 101 Introd. Art and Arch.	3 (1,6)	Arch 102 Introd. Art and Arch.	3 (1,6)
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Math 106 Cal. of One Var.	4 (5,0)	Math 205 Cal. and Lin. Alg.	4 (5,0)
Modern Language (Elementary)	3 (3,1)	Modern Language (Elementary)	3 (3,1)
AS or MS or Elective	1	AS or MS or Elective	1
	17		17

Second Year

Arch 253 Basic Design I	4 (1,9)	Arch 254 Arch. Design II	4 (1,9)
Engl 203 Survey of Engl. Lit.	3 (3,0)	EM 201 Statics	3 (3,0)
Math 206 Cal. of Sev. Var.	4 (5,0)	Engl 204 Surv. Engl. & Am. Lit.	3 (3,0)
Modern Language (Intermediate)	3 (3,1)	Modern Language (Intermediate)	3 (3,0)
Visual Studies I*	2 (0,6)	Visual Studies I*	2 (0,6)
AS or MS or Elective	1	AS or MS or Elective	1
	17		16

Third Year

Arch 315 Arch. Hist. I	3 (3,0)	Arch 316 Arch. Hist. II	3 (3,0)
Arch 353 Arch. Design III	5(1,12)	Arch 354 Arch. Design IV	5(1,12)
EM 304 Mech. of Materials	3 (3,0)	CE 301 Introd. to Struct. Sci.	3 (2,2)
Engl 301 Public Speaking	3 (3,0)	Elective Group I	6
Phil 425 Phil. of Sci.	3 (3,0)		17
	17		

Fourth Year

Arch 331 Arch. Applic. of Comp. Sci.	2	Arch 332 Arch. Applic. of Comp. Sci.	2
Arch 415 Arch. Hist. III	3 (3,0)	Arch 416 Arch. Hist. IV	3 (3,0)
Arch 453 Arch. Design V	5(1,12)	Arch 454 Arch. Design VI	5(1,12)
CE 302 Structural Design I	3 (3,0)	CE 402 Structural Design II	3 (3,0)
Elective Group II	3	Elective Group II	3
Visual Studies II†	2 (0,6)	Visual Studies II†	2 (0,6)
	18		18

137 Total Semester Hours

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* Visual Studies I—Two courses of the following are required: Vis 205, 207, 209, 211, 213, 215.

† Visual Studies II—Two courses of the following are required: Vis 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316.

Elective Group I—At least six credits must be selected from the following courses: Econ 201, Econ 202, Econ 301, Econ 302.

Elective Group II—At least six credits must be selected from the following courses: Phil 201, 302, 303, Pol Sc 201, 202, 301, Soc 201, 202, 331

BUILDING CONSTRUCTION CURRICULUM

First Year

First Semester			*Second Semester*		
Arch Const 141 Elem. and Bldg. I	4	(2,6)	Arch Const 142 Elem. of Bldg. II	4	(2,6)
Arch 101 Introd. to Art and Arch.	3	(1,6)	Arch 102 Introd. to Art & Arch.	3	(1,6)
Engl 101 English Composition	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Engl 102 English Composition	3	(3,0)
AS or MS or Elective	1		Math 205 Cal. and Lin. Alg.	4	(5,0)
			AS or MS or Elective	1	
	15			18	

Second Year

Arch Const 241 Elem. of Bldg. III	4	(2,6)	Arch Const 242 Elem. of Bldg. IV	4	(2,6)
CE 201 Surveying	3	(2,3)	EM 201 Statics	3	(3,0)
Econ 202 Prin. of Economics	3	(3,0)	Engl 204 Surv. of Engl. & Am. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	IM 299 Computer Programming I	1	(0,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phil 425 Philos. of Sci.	3	(3,0)
AS or MS or Elective	1		Soc 201 Introd. to Soc.	3	(3,0)
			AS or MS or Elective	1	
	18			18	

Third Year

Acct 201 Prin. of Accounting	3	(3,0)	Acct 202 Prin. of Accounting	3	(3,0)
Arch Const 341 Bldg. Const. I	4	(2,6)	Arch Const 342 Bldg. Const. II	4	(2,6)
Arch 315 Arch. History I	3	(3,0)	Arch 316 Arch. History II	3	(3,0)
EM 304 Mech. of Materials	3	(3,0)	CE 301 Introd. to Struc. Science	3	(2,2)
IM 312 Commercial Law	3	(3,0)	CE 320 Conc. & Bitum. Materials	2	(1,3)
Soc 351 Industrial Sociology	3	(3,0)	Elective	3	
	19			18	

Fourth Year

Arch Const 441 Bldg. Const. III	4	(2,6)	Arch Const 442 Bldg. Const. IV	4	(2,6)
Arch 415 Arch. History III	3	(3,0)	Arch Const 432 Conc. Form Work	2	(2,0)
Arch 575 Mechanical Plant	2	(2,0)	Arch 416 Arch. History IV	3	(3,0)
CE 302 Structural Design I	3	(3,0)	Arch 576 Mechanical Plant	2	(2,0)
Engl 301 Public Speaking	3	(3,0)	CE 402 Structural Design II	3	(3,0)
Elective	3	(3,0)	Elective	3	
	18			17	

141 Total Semester Hours

COLLEGE OF EDUCATION

The College of Education provides professional programs designed to prepare undergraduate and graduate students for careers in the field of Education. These curriculums are organized to give students the opportunities to (1) acquire a broad general education through liberal arts and science courses; (2) develop depth of knowledge in the teaching area; (3) gain an understanding of the historical, philosophical and psychological backgrounds of American Education; and (4) acquire knowledge of and skill and experience in using effective teaching techniques.

Curriculums for those preparing to teach have been especially designed by a committee from each department offering a teaching major and the College of Education. The Clemson University Teacher Education Committee, composed of four representatives from the teaching-major departments and four public-school administrators, serves in a curriculum advisory capacity to the Dean of the College of Education.

The College of Education offers courses in Agricultural Education, Early Childhood Education, Elementary Education, Industrial Education, Recreation and Park Administration, and Secondary Education.

Programs leading to the Bachelor of Science degree are available in Agricultural Education, Industrial Education, Recreation and Park Administration, and Science Teaching (Biological Science, Chemistry, Physics, or Mathematics). Students preparing to teach in these fields should register as freshmen in the appropriate curriculum in the College of Education.

Students preparing to teach Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Psychology, or Sociology should register in the Bachelor of Arts program in Secondary Education. Those preparing for the elementary level should register for the Bachelor of Arts program in Elementary Education or in Early Childhood Education.

Any student who has been admitted to the University and who is eligible for continuing enrollment may be admitted to the College of Education. However, admission to specific curriculum is selective and requires meeting established criteria. Students who transfer to the College of Education as upperclassmen will be required to meet all the basic requirements for admission to that Education curriculum.

Application to a specific curriculum should be made to the office of the Dean or to the department concerned during the semester preceding that in which the student wishes to obtain admission. Completion of Sc Ed Form 01 and a personal interview are required as part of the application to a specific teacher education curriculum. Sc Ed Form 02, Application for Directed Teaching, must be filed with the faculty adviser no later than the fifth week of the semester preceding the one in which student teaching is to be scheduled. Sc Ed Form 03, Observation and Participation Data, must be completed prior to registration for Directed Teaching.

BACHELOR OF ARTS CURRICULUMS

EARLY CHILDHOOD EDUCATION

The curriculum in Early Childhood Education leads to a Bachelor of Arts degree in Early Childhood Education. It prepares students for teaching positions in kindergarten or grades 1-3. A minimum of 134 semester hours is required for graduation.

Application to Directed Teaching (Ed 484) should be made in writing no later than the fifth week of the semester prior to the one in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

EARLY CHILDHOOD EDUCATION CURRICULUM

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 102 American History	3 (3,0)
Hist 101 American History	3 (3,0)	Math 116 Contemporary Math for Elementary Teachers II	3 (3,0)
Math 115 Contemporary Math for Elementary Teachers I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science*	4
Science*	4	AS or MS or Elective	1
AS or MS or Elective	1		
	18		17

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Math 215 Algebra for Elem. Teach.	3 (3,0)	Math 216 Geom. for Elem. Teach.	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,1)
Science*	4	Science*	4
AS or MS or Elective	1	AS or MS or Elective	1
	17		17

JUNIOR YEAR

Ed 301 History of American Ed.	3 (3,0)	Ed 334 Child Growth & Devel.	3 (3,0)
Engl 351 Children's Literature	3 (3,0)	Ed 459 Fund. of Basic Reading	3 (3,0)
In Ed 372 Arts and Crafts	3 (2,3)	Hist 313 S. C. History	3 (3,0)
Mus 400 Music in Elementary	3 (3,0)	Social Science Elective†	3
Social Science Elective†	3	Electives	5
Ed 302 Educational Psychology	3 (3,0)		
	18		17

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 458 Health Education	3 (3,0)
Ed 336 Behavior Preschool Child.	3 (2,2)	Ed 483 Methods and Materials for Early Childhood Ed.	3 (3,0)
Ed 461 Teaching Read. in Elem.	3 (3,0)	Ed 484 Directed Teaching	6(1,15)
Ed 466 Curr. for Early Child.	3 (3,0)	Mus 310 Music Appreciation	3 (3,0)
Elective	3		
	15		15
		134 Total Semester Hours	

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* Must include Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics or Physical Science.

† Economics, Political Science, Sociology, Philosophy, Religion, Geography.

ELEMENTARY EDUCATION

The curriculum in Elementary Education leads to a Bachelor of Arts degree in Elementary Education. It prepares students for teaching positions on the elementary level. Provisions are made for more detailed study in an instructional interest area. A minimum of 134 semester hours is required for graduation.

Application to Directed Teaching (Ed 481) should be made in writing no later than the fifth week of the semester prior to the one in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

ELEMENTARY EDUCATION CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 102 American History	3	(3,0)
Hist 101 American History	3	(3,0)	Math 116 Contemporary Math for Elementary Teachers II	3	(3,0)
Math 115 Contemporary Math for Elementary Teachers I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	4	
Science*	4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Math 215 Algebra for Elem. Teach.	3	(3,0)	Math 216 Geom. for Elem. Teach.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Science*	4		Science*	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

Junior Year

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Engl 351 Children's Literature	3	(3,0)	Hist 313 S. C. History	3	(3,0)
In Ed 372 Arts and Crafts	3	(2,3)	Social Science Elective†	3	
Mus 400 Music in Elementary	3	(3,0)	Interest Area‡	3	
Social Science Elective†	3		Electives	5	
Interest Area‡	3				
	18			17	

Senior Year

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 334 Child Growth & Develop.	3	(3,0)	Ed 480 Methods & Mater. in Elem.	3	(3,0)
Ed 461 Teaching Read. in Elem.	3	(3,0)	Ed 481 Directed Teaching	6	(1,15)
Interest Area‡	6		Mus 310 Music Appreciation	3	(3,0)
	15			15	

134 Total Semester Hours

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* Must include Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ Interest Area: 12 semester hours in one of these areas: English, Fine Arts, Mathematics, Modern Languages, Natural Sciences, Social Sciences, Special Education.

SECONDARY EDUCATION

Programs leading to a Bachelor of Arts degree in Secondary Education are available to students preparing to teach Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Political Science, Psychology, or Sociology on the high school level. The teaching field should be selected as early as possible in order that appropriate freshman and sophomore courses may be taken.

Each curriculum requires a major concentration in the teaching field. Specific courses and sequences have been designated by teacher education committees to meet requirements for those planning to teach. Students who have elective courses in the teaching area should consult the departmental adviser prior to scheduling these courses.

The Professional Education courses must be completed in sequence prior to registering for the block schedule. Application to Directed Teaching (Ed 412) should be made in writing no later than the fifth week of the semester preceding the one in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for Directed Teaching.

Education 412 is conducted on a full-day basis for one-half semester. Students taking Ed 412 will register for Ed 424, 458 and Mus 310, these three courses being taught on a six-day basis during the first half of the semester.

SECONDARY EDUCATION CURRICULUMS

TEACHING AREA: ECONOMICS

First Semester			*Second Semester*		
Freshman Year					
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science[*]	4	
Science[*]	4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	
Sophomore Year					
Engl 203 Survey of Engl. Lit.	3	(3,0)	Acct 201 Prin. of Accounting	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Prin. of Economics	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Science[*]	4		Science[*]	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	
Junior Year					
Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	2	
	15			14	
Senior Year					
Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[†]	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 310 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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[*] Bot 101, Zool 101, 103; and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

[†] This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior courses consisting of Econ 314, 407; nine semester hours from Econ 302, 403, 404, 410, 412, 420; distributed as follows:

Group A: Econ 314, 407.
Group B: Three courses from these: Econ 302, 403, 404, 410, 412, 420.
Group C: The remaining hours selected from Econ 301, 302, 305, 306, 308, 309, 403, 404, 410, 412, 416, 420, 422, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

TEACHING AREA: ENGLISH

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	4	
Science*	4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Science*	4		Science*	4	
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	14			14	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Hist 361 History of England	3	(3,0)	Hist 363 History of England	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	2	
	18			17	

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 310 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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* Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior English courses distributed as follows:

Group A: Engl 402 or 404, 405, 423 or 424.
Group B: Three courses are required: Engl 461 or 462 and two courses from 409, 416, 425, 427, 431, 436, 443, 445, 446.
Group C: Two courses on the 400 level, or one course on the 400 level and Engl 305.
Engl 304 or departmental certification of proficiency in composition is required.

TEACHING AREA: HISTORY

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	4	
Science*	4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Science*	4		Science*	4	
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

First Semester		*Second Semester*	
Ed 301 History of American Ed.	3 (3,0)	Ed 302 Educational Psychology	3 (3,0)
Teaching Major	9	Teaching Major	9
Elective	3	Elective	2
	15		14

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching‡	6(1,15)
Ed 335 Adol. Growth & Dev.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3 (3,0)
Ed 498 Sec. Sch. Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 310 Music Appreciation	3 (3,0)
	15		15

128 Total Semester Hours

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* Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior History courses: Hist 499, 313 and at least one course from Group A and two courses each from Group B and C.

Group I: Hist 306, 307, 314, 315, 410, 411, 412, 413.
Group II: Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 482, 483, 484.
Group III: Hist 331, 332, 340, 341, 342.

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Math 205 Cal. and Lin. Alg.	4 (5,0)
Math 106 Cal. of One Var.	4 (5,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science*	4
Science*	4	AS or MS or Elective	1
AS or MS or Elective	1		18
	19		

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Math 206 Cal. of Sev. Var.	4 (5,0)	Math 295 Found. of Analysis	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
Science*	4	Science*	4
AS or MS or Elective	1	Social Science Elective†	3 (3,0)
	15	AS or MS or Elective	1
			17

JUNIOR YEAR

Ed 301 History of American Ed.	3 (3,0)	Arch 303 Eval. of Visual Arts	3 (3,0)
Math 308 College Geometry	3 (3,0)	Ed 302 Educational Psychology	3 (3,0)
Math 313 Stat. Methods	3 (3,0)	Math 408 Topics in Geom.	3 (3,0)
Social Science Elective†	3 (3,0)	Math 411 Linear Alg.	3 (3,0)
Elective	3	Elective	2
	15		14

SENIOR YEAR

Ed 335 Adol. Growth & Dev.	3 (3,0)	Ed 412 Directed Teaching‡	6(1,15)
Ed 498 Sec. Sch. Reading	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3 (3,0)
Math 412 Introd. to Mod. Alg.	3 (3,0)	Ed 458 Health Education	3 (3,0)
Math Electives	6	Mus 310 Music Appreciation	3 (3,0)
	15		15

128 Total Semester Hours

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* Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ This semester is a block schedule and must be taken as listed.

Suggested electives: Math 405, 409, 452, 453, 454, Comp Sc 205, 210.

TEACHING AREA: MODERN LANGUAGES (FRENCH, GERMAN, OR SPANISH)

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	4	
Science*	4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Science*	4		Science*	4	
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
Elective	3		Elective	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	2	
	15			14	

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth and Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 310 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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* Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ This semester is a block schedule and must be taken as listed.

The *French* teaching major consists of twenty-four semester hours including Fr 303, 304, 305, 306. Electives from Fr 403, 404, 405, 406, 407, 408.

The *German* teaching major consists of twenty-four semester hours including Ger 303, 304, 305, 306. Electives to complete the requirement.

The *Spanish* teaching major consists of twenty-four semester hours including Span 303, 304, 305, 306. Electives from Span 401, 402, 405, 406.

A student desiring to become certified to teach a second Modern Language must complete the third year of the second language.

TEACHING AREA: NATURAL SCIENCES

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Language	3	(3,1)
Language	3	(3,1)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	

SOPHOMORE YEAR

Bot 101 General Botany	4	(3,3)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Language	3	(3,0)
Language	3	(3,1)	Social Science Elective*	3	
Math 203 Elem. Stat. Infer.	3	(3,0)	Zool 101, 103 General Zoology	4	(3,2)
Social Science Elective*	3		AS or MS or Elective	1	
AS or MS or Elective	1				
	17			14	

JUNIOR YEAR

First Semester			*Second Semester*		
Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Geol 201 Phys. Geol.	3	(3,0)	Geol 204 Hist. Geol.	3	(3,0)
Geol 203 Phys. Geol. Lab.	1	(0,3)	Geol 205 Hist. Geol. Lab.	1	(0,3)
Phys 201 Gen. Physics	3	(3,0)	Phys 202 Gen. Physics	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	Phys 204 Gen. Physics Lab.	1	(0,3)
Elective	3		Elective	2	
Science Elective	3		Science Elective	3	
	17			16	

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Phys 304 Descriptive Astronomy	3	(3,0)	Mus 310 Music Appreciation	3	(3,0)
Science Elective	3				
	15			15	

129 Total Semester Hours

Science electives to be taken in: Biological Sciences, Chemistry, Physics, Geology. This major will meet all state requirements for certification in Natural Sciences, General Sciences and one Science field.

* Economics, Geography, Political Science, Sociology, Philosophy, Religion.

† The last semester of the senior year is a block schedule and must be taken as listed.

TEACHING AREA: POLITICAL SCIENCE

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	4	
Science*	4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18			17	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Pol Sc 101 Introd. to Pol. Sc. I	3	(3,0)	Pol Sc 201 Introd. to Pol. Sc. II	3	(3,0)
Science*	4		Science*	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 402 Educ. Psych.	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	2	
	15			14	

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 310 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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* Bot 101, Zool 101, 103. Two-semester sequence in Chemistry, Physics, Geology, or Phy Sc 101, 102.

† This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior Political Science courses.

Pol Sc 101, 201, and 302, plus 21 semester hours in courses drawn from four of the following fields, including one course in comparative government:

1. American Government—Pol Sc 302, 403, 409.
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433, 434
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473.
7. Comparative Governments—Pol Sc 371, 372, 373 (Recommended)

TEACHING AREA: PSYCHOLOGY

Freshman Year

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 Engl. Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science*	4
Science*	4	AS or MS or Elective	1
AS or MS or Elective	1		
	18		17

Sophomore Year

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Math 203 Elem. Stat. Infer.	3 (3,0)	Modern Language	3 (3,0)
Modern Language	3 (3,1)	Psych 202 Exp. Psych. I	3 (2,2)
Psych 201 General Psychology	3 (3,0)	Science*	4
Science*	4	Social Science Elective†	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	17		17

Junior Year

Ed 301 History of Amer. Ed.	3 (3,0)	Ed 302 Educ. Psych.	3 (3,0)
Teaching Major	9	Teaching Major	6
Elective	3	Social Science Elective†	3 (3,0)
		Elective	2
	15		14

Senior Year

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching‡	6(1,15)
Ed 335 Adol. Growth & Develop.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3 (3,0)
Ed 498 Sec. School Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 310 Music Appreciation	3 (3,0)
	15		15

128 Total Semester Hours

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* Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

† Economics, Geography, Philosophy, Political Science, Religion, Sociology.

‡ This semester is a block schedule and must be taken as listed.

The teaching major requires 24 semester hours of junior and senior courses selected from Psych 302, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 490, 498, Ed 302, 335.

Ed 302 is counted in the teaching area.

TEACHING AREA: SOCIOLOGY

Freshman Year

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science*	4 (3,3)
Science*	4 (3,3)	AS or MS or Elective	1
AS or MS or Elective	1		
	18		17

Sophomore Year

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Math 203 Elem. Stat. Infer.	3 (3,0)	Modern Language	3 (3,0)
Modern Language	3 (3,1)	Soc 202 Social Problems	3 (3,0)
Soc 201 Introductory Soc.	3 (3,0)	Science*	4 (3,3)
Science*	4 (3,3)	Elective‡	3
AS or MS or Elective	1	AS or MS or Elective	1
	17		17

JUNIOR YEAR

First Semester			*Second Semester*		
Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educ. Psych.	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective‡	6		Elective‡	5	
	18			17	

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Direct Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 310 Music Appreciation	3	(3,0)
	15			15	

134 Total Semester Hours

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* Bot 101, Zool 101, 103 and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

† This semester is a block schedule and must be taken as listed.

‡ Electives must include Econ 201, 202, Phil 201, 302, Pol Sc 301.

The teaching major consists of Soc 411, 421, and the remaining from Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 431, 441, 451, 481, 499.

BACHELOR OF SCIENCE CURRICULUMS

AGRICULTURAL EDUCATION ‡

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations, and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations and agricultural extension; farming, soil conservation and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in business or international agriculture or in one of six subject-matter fields. Students in other departments may minor in Agricultural Education and be certified to teach.

AGRICULTURAL EDUCATION CURRICULUM ‡

FRESHMAN YEAR *

First Semester			*Second Semester*		
Ag 101 Introd. to Agric.	1	(1,0)	Ch 102 General Chemistry	4	(3,3)
Bot 101 Gen. Botany	4	(3,3)	Engl 102 English Composition	3	(3,0)
or Zool 101 Gen. Zoology	3	(3,0)	Math 104 Trigonometry	2	(3,0)
and Zool 103 Gen. Zool. Lab.	1	(0,2)	Zool 101 Gen. Zoology	3	(3,0)
Ch 101 General Chemistry	4	(3,3)	and Zool 103 Gen. Zool. Lab.	1	(0,2)
Engl 101 English Composition	3	(3,0)	or Bot 101 Gen. Botany	4	(3,3)
Math 103 College Algebra	2	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			17	

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‡ Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

* Horticulture (Ornamental) students take EG 101, Freehand Sketching—1 cr. (0,3), in addition to other courses in the first semester.

† To be selected from the following: Hist 102, Phil 201, Psych 201, Soc 201.

Sophomore Year

First Semester			*Second Semester*		
Ag 202 Introd. to Plant Sciences	3	(2,3)	AgE 205 Farm Shop	3	(2,3)
Ag Ed 201 Introd. to Agric. Ed.	3	(2,2)	AgE 206 Agric. Mechanization	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	Ag 201 Introd. to Animal Industries	3	(2,3)
Hist 203 History of Civilization	3	(3,0)	Agron 202 Soils	3	(2,2)
or Engl 203 Surv. of Engl. Lit.*	3	(3,0)	Engl 204 Surv. of Engl. and Amer. Lit.*	3	(3,0)
Phys 201 Gen. Physics	3	(3,0)	or Hist 204 Hist. of Civilization	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	or Hist 104 Western Civilization	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

Junior Year

AgE 301 Soil and Water Conserva.	3	(2,3)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Agron 301 Fertilizers	3	(3,0)	An Sc 301 Feeds and Feeding	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	For 307 Elem. of Forestry	3	(2,3)
Approved Horticulture Elective	3		Minor†	9	
Minor†	3			18	
Approved Electives	3				
	18				

Senior Year

Ag Ec 452 Agric. Policy	3	(3,0)	Ag Ed 401 Methods in Agric. Education	3	(2,2)
Ent 301 Elem. and Econ. Ent.	3	(2,3)	Ag Ed 406 Directed Teaching	6	(0,18)
Hort 407 Landscape Design	3	(2,3)	Ag Ed 422 Introd. to Adult Educ.	3	(2,2)
Pl Pa 401 Plant Pathology	3	(2,3)	Ed 302 Education Psychology	3	(3,0)
Minor†	3			15	
Approved Electives	3				
	18		134 Total Semester Hours		

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* At least one literature course is required.

† See class adviser for available minors and course requirements.

INDUSTRIAL EDUCATION

The curriculum in Industrial Education is designed to prepare students for careers in the teaching of industrial subjects and in training programs in industry. To accomplish these purposes the curriculum is divided into three areas of specialization leading to the degree of Bachelor of Science in Industrial Education. At the end of his freshman year, each student will select one of three options: Industrial Arts Education, Vocational-Technical Education, or Education for Industry. Each option requires 135 semester hours of course work.

The Industrial Arts Education option is for those students who desire to teach industrial arts in the secondary schools. Industrial arts is the subject area in the public school system which attempts to provide youth with an interpretation of American industry. It is a general education subject designed to give students exploratory experience in the classroom and laboratory. Majors in this option are qualified for full certification as secondary school teachers of industrial arts.

The Vocational-Technical Education option is designed to prepare teachers of vocational and technical subjects in the Senior High Schools, Area Vocational Schools, and Technical Education

Centers. All elective courses in this option will be in an area of specialization or related fields. Teachers graduating from this option will possess the skills and knowledge required to teach the occupation or family of occupation in their area of specialization.

The Education for Industry option is designed to prepare students to enter industry as training specialists. Due to the expansion of technology and industrial development, there is a rapidly increasing demand for training specialists and training directors in industry.

EDUCATION FOR INDUSTRY OPTION

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to In. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math Analysis	3	(3,0)	Math 102 Math. Analysis	3	(3,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

Sophomore Year

First Semester			*Second Semester*		
EG 201 Engr. Graph. for In. Ed.	3	(1,6)	Econ 201 Principles of Econ.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 204 Graphic Arts	3	(1,6)
Soc 201 Introd. to Soc.	3	(3,0)	Psych 201 Gen. Psychology	3	(3,0)
Science Elective*	4	(3,3)	AS or MS or Elective	1	
AS or MS or Elective	1		Elective	3	
	17			16	

Junior Year

First Semester			*Second Semester*		
Econ 301 Labor Problems	3	(3,0)	IE 303 Job Evaluation	3	(3,0)
Ed 302 Ed. Psychology	3	(3,0)	IM 415 Managerial Dec. Making	3	(3,0)
IM 307 Personnel Management	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 325 Ind. Org. & People	3	(3,0)
In Ed 303 Electricity	3	(1,6)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Approved Elective‡	3	(3,0)	Approved Elective‡	3	(3,0)
	17			18	

Senior Year

First Semester			*Second Semester*		
Engl 301 Public Speaking	3	(3,0)	In Ed 408 Train. Prog. in Ind.	3	(3,0)
IM 408 Work Simp. & Std.	3	(2,3)	In Ed 496 Pub. Relations	3	(3,0)
In Ed 405 Course Org. & Eval.	3	(3,0)	Soc 351 Ind. Soc.	3	(3,0)
Text 460 Textile Processes	3	(3,0)	Approved Elective‡	9	(9,0)
Approved Elective‡	6	(6,0)			
	18			18	

135 Total Semester Hours

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* Science electives to be selected from Chemistry, Physics, Geology, Physical Science, Botany, or Zoology. At least two fields must be represented.

† Social Science electives to be selected from History, Sociology, Economics, Political Science, Religion, or Philosophy.

‡ See class adviser for list of elective courses.

Note: One summer (400 clock hours) of field experience is required of each student following the completion of his sophomore year.

INDUSTRIAL ARTS EDUCATION OPTION

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to In. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math. Analysis	3	(3,0)	Math 102 Math. Analysis	3	(3,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

Sophomore Year

EG 201 Engr. Graph. for In. Ed.	3	(1,6)	EG 202 Graphic Tech. or In. Ed.	3	(1,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
In Ed 202 Woodworking II	2	(1,3)	In Ed 204 Graphic Arts	3	(1,6)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 205 Power Technology	3	(2,2)
Science Elective*	4	(3,3)	In Ed 313 Arts & Crafts	3	(2,3)
AS or MS or Elective	1		Social Science Elective†	3	(3,0)
			AS or MS or Elective	1	
	16			19	

Junior Year

Ed 302 Ed. Psychology	3	(3,0)	Ed 335 Adol. Growth & Develop.	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 314 Basic Electronics	3	(1,6)
In Ed 303 Electricity	3	(1,6)	In Ed 333 Design	3	(2,3)
Social Science Elective†	3	(3,0)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Text 460 Textile Processes	3	(3,0)	In Ed 441 Com. Shop Practices	2	(2,0)
Approved Elective‡	2	(2,0)			
	19			17	

Senior Year

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 406 Hist. & Phil. of Ed.	3	(3,0)	In Ed 402 Directed Teaching	6	(0,18)
In Ed 405 Course Org. & Eval.	3	(3,0)	In Ed 425 Teaching Ind. Subj.	3	(3,0)
In Ed 416 Des. & Op. In. Ed. Lab.	3	(2,2)	Mus 310 Music Appreciation	3	(3,0)
Approved Elective‡	6	(6,0)		15	
	18				

135 Total Semester Hours

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* Science electives to be selected from Chemistry, Physics, Geology, Botany, Zoology, or Physical Science. At least two fields must be represented, one of which must be in the biological sciences.

† Social Science electives to be selected from History, Sociology, Economics, Political Science, Religion, or Philosophy. At least two fields must be represented, with six, but not more than six hours, in one field.

‡ See class adviser for list of approved electives.

VOCATIONAL-TECHNICAL EDUCATION OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to In. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math. Analysis	3	(3,0)	Math 102 Math. Analysis	3	(3,0)
Science Elective[*]	4	(3,3)	Science Elective[*]	4	(3,3)
Social Science Elective[†]	3	(3,0)	Social Science Elective[†]	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

SOPHOMORE YEAR

EG 201 Engr. Graph. for In. Ed.	3	(1,6)	EG 202 Graphic Tech. or In. Ed.	3	(1,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
In Ed 202 Woodworking II	2	(1,3)	In Ed 204 Graphic Arts	3	(1,6)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 205 Power Technology	3	(2,2)
Science Elective[*]	4	(3,3)	Social Science Elective[†]	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SUMMER

In Ed 350 Ind. Cooperative Experience ..... 6 cr.

JUNIOR YEAR

Ed 302 Ed. Psychology	3	(3,0)	Ed 335 Adol. Growth & Develop.	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 333 Design	3	(2,3)
In Ed 303 Electricity	3	(1,6)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Approved Elective (in field of specialization)[‡]	4	(4,0)	Social Science Elective[†]	3	(3,0)
	15			15	

SUMMER

In Ed 350 Ind. Cooperative Experience .... 6 cr.

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 406 Hist. & Phil. of Ed.	3	(3,0)	In Ed 402 Directed Teaching	6	(0,18)
In Ed 405 Course Org. & Eval.	3	(3,0)	In Ed 425 Teaching Ind. Subj.	3	(3,0)
In Ed 416 Des. & Op. In. Ed. Lab.	3	(2,2)	Mus 310 Music Appreciation	3	(3,0)
Approved Elective (in field of specialization)[‡]	3	(3,0)		15	
	15				

135 Total Semester Hours

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[*] Science electives to be selected from Chemistry, Physics, Geology, Physical Science, Botany or Zoology. At least two fields must be represented, one of which must be in the biological sciences.

[†] Social Science electives to be selected from History, Sociology, Economics, Political Science, Religion, or Philosophy. At least two fields must be represented, with six, but not more than six hours, in one field.

[‡] See class adviser for list of approved electives.

RECREATION AND PARK ADMINISTRATION

The curriculum in Recreation and Park Administration provides training for students who desire to become recreation supervisors and directors and park administrators. Graduates plan and supervise recreation programs in industry, institutions, municipalities and rural communities. The program which leads to a Bachelor of Science degree is designed to provide competencies in recreation administration, management, development, planning, and research. It requires 135 semester hours, including field training during one summer, for completion.

RECREATION AND PARK ADMINISTRATION CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Bot 101 General Botany	4	(3,3)	Econ 201 Principles of Econ.	3	(3,0)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 102 American History	3	(3,0)	RPA 102 Hist. and Prin. of Outdoor Rec.	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	RPA 203 Per. and Com. Health	3	(3,3)
RPA 101 Introd. to Com. Rec.	3	(3,0)	Zool 101, 103 Gen. Zool.	4	(3,2)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Acct 201 Principles of Acct.	3	(3,0)
Physical Science*	4		Ed 335 Adol. Growth & Develop.	3	(3,0)
Psych 201 General Psych.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
RPA 204 Sports in Rec.	3	(2,3)	Physical Science*	4	
Soc 201 Introd. to Soc.	3	(3,0)	RPA 205 Prog. Plan. for Rec.	3	(2,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

Junior Year

Engl 301 Public Speaking	3	(3,0)	Hort 308 Landscape Design	3	(2,3)
Hort 303 Plant Materials I	3	(2,2)	IM 307 Personnel Mgt.	3	(3,0)
RPA 302 Camp Org. and Adm.	3	(2,3)	RPA 307 Pk. Main. and Oper.	4	(3,3)
RPA 306 Prin. of Outdoor Educ.	3	(3,0)	RPA 308 Meth. and Tech. of Rec. Leadership	3	(3,0)
Elective	3		Elective	2	
	15			15	

SUMMER

RPA 405 Field Training in Rec. 8

Senior Year

Ag Ec 352 Public Finance	3	(3,0)	For 406 For. Pol. and Adm.	2	(2,0)
Ed 491 Descript. Stat.	3	(3,0)	RPA 402 Rec. and Park Adm.	3	(3,0)
RPA 403 Facility & Site Plan.	3	(2,3)	RPA 404 Meth. of Rec. Res.	3	(3,0)
Pol Sc 302 St. & Local Gov't	3	(3,0)	Soc 331 Urban Sociology	3	(3,0)
Elective	3		Electives	3	
	15			14	

135 Total Semester Hours

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* Two-semester sequence in Chemistry, Geology, Physics, or Physical Science I, II.

SCIENCE TEACHING

The program leading to a Bachelor of Science degree in Science Teaching is designed for students planning to teach Mathematics, Biology, Chemistry or Physics and General Science on the secondary school level.

It requires a major concentration in Mathematics, Biological Sciences, Chemistry or Physics. The required science electives are included to give some degree of competency in a field other than the major area.

A student must have a minimum of 130 semester hours of credit for graduation.

TEACHING AREA: BIOLOGICAL SCIENCES

FRESHMAN YEAR

First Semester		*Second Semester*	
Ch 101 General Chemistry	4 (3,3)	Ch 102 General Chemistry	4 (3,3)
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Math 106 Cal. of One Var.	4 (5,0)
Math 103 College Algebra	2 (3,0)	AS or MS or Elective	1
Math 104 Trigonometry	2 (3,0)		
AS or MS or Elective	1		
	16		15

SOPHOMORE YEAR

Bot 101 General Botany	4 (3,3)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Engl 203 Survey of Engl. Lit.	3 (3,0)	Chemistry Elective	4
Chemistry Elective	4	Phys 202 Gen. Physics	3 (3,0)
Phys 201 Gen. Physics	3 (3,0)	Phys 204 Gen. Physics Lab.	1 (0,3)
Phys 203 Gen. Physics Lab.	1 (0,3)	Zool 101 Gen. Zoology	3 (3,0)
AS or MS or Elective	1	Zool 103 Gen. Zoology Lab.	1 (0,2)
		AS or MS or Elective	1
	16		16

JUNIOR YEAR

Bot 202 Surv. of Plant Kingdom	4 (3,3)	Bot 352 Plant Physiology	4 (3,3)
Ed 301 History of Amer. Ed.	3 (3,0)	or Zool 458 Cell Physiology	3 (2,3)
Zool 301 Vertebrate Anatomy	3 (2,3)	Ed 302 Educational Psych.	3 (3,0)
Science Elective	3	Gen 302 Genetics	3 (2,3)
Social Science Elective*	3	Micro 301 Gen. Microbiology	4 (3,3)
Elective	2	Social Science Elective*	3
	18		17 or 16

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching‡	6(1,15)
Ed 335 Adol. Growth & Develop.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3 (3,0)
Ed 498 Sec. School Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Major Electives†	6 or 7	Mus 310 Music Appreciation	3 (3,0)
Elective	3		
	18 or 19		15

131 Total Semester Hours

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* Economics, Geography, Philosophy, Political Science, Religion, Sociology.

† Botany, Genetics, Microbiology, Zoology.

‡ Block schedule must be taken as shown.

TEACHING AREA: CHEMISTRY

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			15	

Sophomore Year

Bot 101 General Botany	4	(3,3)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Phys 202 Gen. Physics	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 204 Gen. Physics Lab.	1	(0,3)
Phys 201 Gen. Physics	3	(3,0)	Zool 101 Gen. Zoology	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	Zool 103 Gen. Zoology Lab.	1	(0,2)
AS or MS or Elective	1		Social Science Elective[*]	3	
			Elective	3	
	16		AS or MS or Elective	1	
				18	

Junior Year

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 331 Physical Chem.	3	(3,0)
Ch 313 Quantitative Analysis	3	(3,0)	Ch 339 Physical Chem. Lab.	1	(0,3)
Social Science Elective[*]	3		Elective	6	
Elective	5				
				16	
	18				

Senior Year

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[†]	6	(1,15)
Ch 332 Physical Chem.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ch 334 Physical Chem. Lab.	2	(0,6)	Ed 458 Health Education	3	(3,0)
Ch 402 Inorganic Chemistry	3	(3,0)	Mus 310 Music Appreciation	3	(3,0)
Ed 335 Adol. Growth & Develop.	3	(3,0)			
Ed 498 Sec. School Reading	3	(3,0)		15	
	17				

131 Total Semester Hours

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[*] Economics, Geography, Philosophy, Political Science, Religion, Sociology.

[†] Block schedule must be taken as shown.

TEACHING AREA: MATHEMATICS

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			15	

Sophomore Year

Bot 101 General Botany	4	(3,3)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Math 295 Found. of Anal.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 202 Gen. Physics	3	(3,0)
Phys 201 Gen. Physics	3	(3,0)	Phys 204 Gen. Physics Lab.	1	(0,3)
Phys 203 Gen. Physics Lab.	1	(0,3)	Zool 101 Gen. Zoology	3	(3,0)
AS or MS or Elective	1		Zool 103 Gen. Zoology Lab.	1	(0,2)
			AS or MS or Elective	1	
	16			15	

Junior Year

First Semester			Second Semester		
Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Math 308 College Geometry	3	(3,0)	Math 408 Topics in Geom.	3	(3,0)
Math 313 Stat. Th. & Meth. I	3	(3,0)	Math 411 Linear Algebra	3	(3,0)
Science Elective	3		Science Elective	3	
Social Science Elective*	3		Social Science Elective*	3	
Elective	3		Elective	2	
	18			17	

Senior Year

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)	Mus 310 Music Appreciation	3	(3,0)
Math Elective‡	6	(6,0)			
	18			15	

130 Total Semester Hours

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* Economics, Geography, Philosophy, Political Science, Religion, Sociology.
† Block schedule must be taken as shown.
‡ Suggested electives: Math 405, 409, 452, 453, 454, Comp Sc 205, 210.

TEACHING AREA: PHYSICS

Freshman Year

First Semester			Second Semester		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

Sophomore Year

Bot 101 General Botany	4	(3,3)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 222 Optics and Mod. Phys.	3	(3,0)
Phys 221 Therm. and Elect. Phen.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Zool 101 Gen. Zoology	3	(3,0)
AS or MS or Elective	1		Zool 103 Gen. Zoology Lab.	1	(0,2)
			AS or MS or Elective	1	
	16			16	

Junior Year

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Phys 304 Descriptive Astronomy	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Phys 321 Mechanics I	3	(3,0)	Phys 326 Exp. Physics II	4	(2,6)
Phys 325 Experimental Phys. I	4	(2,6)	Phys 341 Electricity & Magnetism	3	(3,0)
Science Elective	3		Social Science Elective*	3	
Social Science Elective*	3				
	19			16	

Senior Year

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Phys 455 Quantum Phys. I	3	(3,0)	Mus 310 Music Appreciation	3	(3,0)
or Phys 460 Modern Phys.	3	(3,0)			
Elective	6				
	18			15	

134 Total Semester Hours

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* Economics, Geography, Philosophy, Political Science, Religion, Sociology.
† Block schedule must be taken as shown.

COLLEGE OF ENGINEERING

The College of Engineering offers professional curricular programs and programs in both Engineering Analysis and Technical Operations. Each of the programs offered leads to a wide range of career opportunities and serves as preparation for further study at the graduate level.

Professional Curriculums: Six four-year, professional oriented curriculums are offered by the College of Engineering, namely, Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering. Each of these curriculums is accredited by the Engineers' Council for Professional Development, the recognized national accrediting agency for professional curriculums in engineering. The curriculum in Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

Although the College of Engineering does not offer specific options or majors in each of these professional curriculums, the instruction includes many phases of each respective field. Thus, a Civil Engineering student is graduated in Civil Engineering rather than Structural Engineering, Highway Engineering, Sanitary Engineering, or other such options. However, a student who wishes to study within the areas encompassed by these options will find adequate courses within the Civil Engineering curriculum to prepare himself for work in any of these areas. In the same way the other engineering curriculums include thorough education in various phases of the field of specialization without over-emphasizing one phase to the neglect of others. The professional curriculums lead to a Bachelor of Science degree in the specific professional area.

The courses required in all professional curriculums for the freshman year are as follows:

Freshman Year

First Semester			*Second Semester*[*]		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engr 101 Engineering Systems	0	(1,0)	Engl 102 English Composition	3	(3,0)
EG 109 Engr. Graph. Com.	2	(0,6)	Humanistic—Social Elective	3	(3,0)
or Humanistic—Social Elective	3	(3,0)	or EG 109 Engr. Graph. Com.	2	(0,6)
Engl 101 English Composition	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
Humanistic—Social Elective	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1			18 or 17	
	17 or 18				

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[*] Agricultural Engineering students take Ag 101, Introduction to Agriculture, in addition to other courses in the second semester.

Engineering Analysis Curriculum:† This curriculum is a four-year, engineering science-oriented course of study. Its objectives are two-fold. These are (1) to prepare a student for employment in areas of engineering activity requiring a high level of analytical competency, and (2) to provide a flexible undergraduate preparation for the study of engineering at the graduate level.

The curriculum leads to the Bachelor of Science degree in Engineering Analysis. Requirements for this degree are stated in terms of subject matter area rather than in terms of specific courses. This latitude of course selection permits maximum accommodation of the individual student's interests and career objectives. Degree requirements are as follows:

	Semester Credit Hours
Mathematics (including 12 credits of post-calculus mathematics)	24
Basic Science (including 8 credits of physics)	16
Engineering Science (distributed in at least six engineering science areas)	32
Humanistic-Social Studies	32
Electives	30
AS or MS or Elective	4
	138

The educational objectives of the program will be met by the selection of an area of concentration which will be chosen from several specialty areas offered within the other professional engineering curriculums. The selection of specific courses, particularly in the junior and senior years, will then depend primarily on the choice of the area of concentration.

Maximum flexibility within this program is achieved by permitting a student to defer his choice of specialization until the junior year or later. Such deferral will then allow students from junior and senior colleges not offering engineering to transfer into the program with little or no loss in academic credit.

Technical Operations Curriculum:† This curriculum is a four-year, student-interest oriented course of study designed to prepare technical graduates for such industrial functions as production supervision and management, operation and maintenance of plant environmental and energy systems, and technical sales and purchasing.

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† Additional information on both the Engineering Analysis and the Technical Operations programs is available from the Office of the Dean of Engineering.

The curriculum leads to the Bachelor of Science degree in Technical Operations. Requirements for the degree are as follows:

	Semester Credit Hours
Mathematics	16
Basic Science (including 8 credits of physics)	16
Humanistic-Social	24
Technical Operations	36
Electives	32
AS or MS or Elective	4
	128

The technical operations courses are only offered during the junior and senior years of the program. Hence, a student from a junior college may transfer into the program at the junior level with little or no loss of academic credit.

AGRICULTURAL ENGINEERING*

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The Agricultural Engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electic power and processing, structures and environment, and food engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

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* The Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to both the Master of Science and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, an extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

AGRICULTURAL ENGINEERING CURRICULUM

(See page 172 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
AgE 221 Soil and Water Res. Engr. I	3	(2,3)	AgE 212 Fund. of Mechanization	3	(2,3)
EM 201 Engr. Mech. (Statics)	3	(3,0)	Bot 101 General Botany	4	(3,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 221 Ther. and Elec. Phen.	3	(3.0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

Junior Year

AgE 353 Computational Systems	2	(0,6)	AgE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AgE 355 Engr. Anal. and Creat.	2	(1,3)	AgE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
EE 307 Basic Elec. Engr.	3	(3,0)	Agron 202 Soils	3	(2,2)
EM 304 Mechanics of Materials	3	(3,0)	EE 308 Basic Elec. Engr.	3	(3,0)
ME 311 Engr. Thermo. I	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Zool 101Gen. Zoology	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Zool 103 Gen. Zoology Lab.	1	(0,2)			
	17			16	

Senior Year

AgE 431 Agric. Struct. Design	3	(2,3)	AgE 416 Agric. Machinery Design	3	(2,3)
AgE 471 Undergraduate Research	1	(0,3)	AgE 422 Soil & Water Res. Engr. II	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	AgE 442 Agric. Proc. Engr.	3	(2,3)
EM 320 Fluid Mechanics	3	(3,0)	Bot 352 Plant Physiology	4	(3,3)
Math 313 Stat. Theory and Meth. I	3	(3,0)	or Zool 307 Animal Anatomy and Physiol.	3	(2,3)
Approved Electives	3		or Micro 301 Gen. Microbiology	4	(3,3)
			ME 304 Heat Transfer	3	(3,0)
			Approved Electives	2 or 3	
	16			18	

138 Total Semester Hours

CERAMIC ENGINEERING

Ceramic Engineering offers rewarding careers for persons interested in making useful products. The ceramic products range from items important to everyday life, such as brick, cement, and glass to more exotic products, such as ceramic fuel elements for nuclear reactors, ceramic parts for electronic equipment and ceramic nose cones, ceramic heart valves, and other prosthetic parts for medical research. A variety of occupations are available to the ceramic engineering graduate thus making it possible to select a type of work that is compatible with individual preferences. Some graduates work as researchers, developing new ceramic knowledge; others are design engineers, creating new processes or new products; still others are engaged in technical sales, supervision of plant operations or in management.

South Carolina possesses a wide variety of ceramic minerals which rank with forests as the richest natural resources in the State and make it possible for South Carolina to contribute raw materials to every major classification of the ceramic industry. South Carolina has a diversified ceramic industry with plants manufacturing portland cement, glass containers, glass fibers, sewer pipes, brick, refractories, special raw materials, and electronic ceramics.

The curriculum of Ceramic Engineering leads to the degree of Bachelor of Science in Ceramic Engineering, and graduate courses are offered leading to advanced degrees. The course is based on a study of the fundamental courses in chemistry, physics, mathematics, and geology, and advanced courses are designed to apply these fundamental sciences to Ceramic Engineering. Courses in the humanities and social sciences together with courses in engineering sciences form major parts of the curriculum. A large number of elective courses permits the individual student to plan a program that is compatible with his particular interests, talents, and educational goals.

The Ceramic Engineering building and equipment are recognized as outstanding throughout the nation. These facilities were provided by a grant from the Olin Foundation.

CERAMIC ENGINEERING CURRICULUM

(See page 172 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
CrE 201 Introd. to Cer.	2	(2,0)	CrE 202 Materials	3	(3,0)
CrE 204 Lab. Procedures	1	(0,3)	EE 298 Dig. Comp.	1	(1,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Planned Elective	3	(3,0)	Planned Elective	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

JUNIOR YEAR

CrE 304 Exp. Design	1	(0,3)	CrE 302 Thermo. Chem. Cer.	3	(3,0)
CrE 307 Thermal Process.	3	(3,0)	CrE 309 Research Meth.	2	(0,6)
Ch 331 Physical Chem.	3	(3,0)	Ch 332 Physical Chem.	3	(3,0)
EM 201 Statics	3	(3,0)	EE 330 Systems I	2	(2,0)
Math 313 Statistics	3	(3,0)	EE 331 Workshop I	2	(0,4)
Planned Elective	3	(3,0)	Planned Elective	3	(3,0)
			Free Elective	3	
	16			18	

SENIOR YEAR

CrE 402 Solid St. Cer.	3	(3,0)	CrE 403 Glasses	3	(3,0)
EE 320 Electronics I	2	(2,0)	ME 304 Heat Transfer	3	(3,0)
EM 304 Mech. of Matls.	3	(3,0)	Planned Electives	10	
Planned Electives	7				
Free Elective	3				
	18			16	

138 Total Semester Hours

Note: 9 credits of Planned Electives must be taken in humanistic-social science courses. 19 credits of Planned Electives should be technical courses selected with the help of class adviser.

CHEMICAL ENGINEERING

The graduate of the science-oriented, research-minded Chemical Engineering Department is finding intellectually stimulating and financially rewarding positions in all phases of modern industry. Because of the fundamental nature of the Chemical Engineering curriculum, the graduate is avidly sought by the newer nuclear and space-oriented industries, as well as by the equally important chemical-process industries. Indeed, the chemical engineer is in great demand in areas of technology, such as textiles, metals, aircraft, power, instrumentation, computers, foods, pulp and paper, and petroleum.

The curriculum is built upon a base of *three* sciences (chemistry, physics, and mathematics) with supporting courses in mechanics, electrical engineering, and materials engineering and culminates in a solid core of courses in chemical engineering. In all such courses the emphasis is upon *why* things happen as they do and not *how;* thus, the student is taught principles that will endure and not the methods of the present or past. He is taught to realize that all material things are chemical in nature; hence, the chemical engineer in the practice of his profession may be called upon to work with anything on the face of the earth. The scope of chemical engineering is broad.

In spite of the strong scientific flavor of the Chemical Engineering curriculum, the faculty is constantly striving to impress upon the student that he is studying engineering and not pure science. The ultimate purpose of engineering is to make some practical use of scientific and engineering theories; hence, economics must always be kept in mind during the design of engineering processes or products. In brief, the chemical engineer in industry, as contrasted to the pure research scientist, is concerned that his company makes a profit.

In industry the chemical engineer may pursue one of two parallel lines of advancement. One path leads to management, and it should be noted that the top management of most chemical companies consists of former technical men. The second and equally rewarding path is in engineering research and development. In this latter category are found the men who have developed the processes and products which shape the modern world in which we live.

The Chemical Engineering Department at Clemson is housed in Earle Hall which is one of the newest and best equipped buildings for chemical engineering education in the Southeast. All members of the Chemical Engineering faculty have been educated at the doctoral level and the department offers work leading to the Master of Science and Doctor of Philosophy degrees as well as the Bachelor of Science degree.

CHEMICAL ENGINEERING CURRICULUM

(See page 172 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
ChE 204 Introd. to ChE I	2	(1,3)	ChE 205 Introd. to ChE II	3	(2,3)
Ch 223 Organic Chem.	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
EM 201 Statics	3	(3,0)	Ch 228 Organic Chem. Lab.	1	(0,3)
Engl 203 English Lit.	3	(3,0)	Comp Sc 210 Algorith. Process. for Engrs.*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1	(2,1)	AS or MS or Elective	1	(2,1)
	19			18	

JUNIOR YEAR

ChE 301 Unit Op. Theory I	3	(3,0)	ChE 302 Unit. Op. Theory II	3	(3,0)
ChE 307 Analog. Comp.	1	(0,3)	ChE 306 Unit Op. Lab. I	1	(0,3)
Ch 331 Physical Chem.	3	(3,0)	ChE 331 ChE Thermo. I	3	(3,0)
Ch 339 Physical Chem. Lab.	1	(0,3)	Ch 332 Physical Chemistry	3	(3,0)
EE 307 Basic EE	3	(3,0)	Ch 340 Phys. Chem. Lab.	1	(0,3)
EM 304 Mech. of Matls.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Math 309 Engr. Math II	3	(3,0)	Humanistic–Social Elective	3	(3,0)
Free Elective	3				
	20			17	

SENIOR YEAR

First Semester			*Second Semester*		
ChE 401 Trans. Phen.	3	(3,0)	CrE 419 Engr. Materials	3	(3,0)
ChE 407 Unit Op. Lab. II	2	(0,6)	ChE 410 Unit Op. Theory III	3	(3,0)
ChE 421 Dev., Des. & Op. I	3	(2,3)	ChE 422 Dev., Des., & Opt. II	3	(0,9)
ChE 430 ChE Thermo. II	3	(3,0)	ChE 453 Process. Dynm.	3	(3,0)
ChE 440 Inspection Trip	0		Free Elective	3	
ChE 450 ChE Kinetics	3	(3,0)	Humanistic–Social Elective	3	(3,0)
Humanistic–Social Elective	3	(3,0)			
	17			18	

144 Total Semester Hours

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* Or ChE 210 if offered.

Note: Six credit hours of Advanced MS or AS may be taken as the Free Electives.

Elective Policy. All electives must be chosen from a departmental elective list. A copy of this list may be obtained from the departmental secretary.

CIVIL ENGINEERING

Civil Engineering is the broadest in scope of the engineering professions, being the parent stem from which most of the other branches of engineering have developed. All branches of Civil Engineering rest on a comparatively compact body of principles, in which the students are thoroughly trained in the classroom, the drafting room, the laboratory, and the field. Particular effort is made to develop those qualities essential to success in any field of endeavor and to fit the graduate to become a useful citizen—a good business man as well as a successful engineer.

The practice of civil engineering involves the planning, design, construction, maintenance, and use of large structures and systems to control and improve the environment for modern civilization. The structures may serve many purposes, such as buildings for commerce and industry, bridges for transportation, vehicles for space exploration, or dams for the control and storage of water or for generation of power. The systems provide essential services: water supply; waste water treatment; rail, air, and water transportation; and systems of highways. Projects such as these require that the civil engineer be trained in the social and economic issues as well as in basic science, engineering science, and technology. Though he may specialize in a particular branch of civil engineering, such as structural or transportation, he will need some acquaintance with all subdivisions of civil engineering as well as of other branches of engineering.

The course in Civil Engineering at Clemson University leads to the degree of Bachelor of Science and is planned to equip the graduate with a working knowledge of the above subjects. The student receives early drill in the basic sciences of mathematics, chemistry, and physics, and is introduced gradually to the engineering sciences and the technical courses in civil engineering. By the end of the junior year the student will have had courses in structural design, construction materials, transportation engineering, and soil mechanics. These will enable him to choose technical electives in his senior year in the subdivision of his choice. The non-technical electives are sufficient in number to provide breadth in the arts and humanities, and assure that the graduate has a well-rounded education.

The civil engineering graduate is prepared to work immediately upon graduation in practically any of the areas of the profession. He may find himself in responsible charge at an early date, so every effort is made to train him at Clemson in the ethical standards demanded by the profession. All courses are directed toward the development of initiative, self-reliance, and integrity in the student.

The department is located in Lowry Hall, a modern air-conditioned structure erected in 1958. The laboratories are well equipped, and the classrooms are light and conducive to study. The building has an internal television system and the 220-seat auditorium is one of the most attractive ones on the campus.

CIVIL ENGINEERING CURRICULUM

(See page 172 for *Freshman Year*)

First Semester			*Second Semester*		
SOPHOMORE YEAR					
CE 205 Civil Engr. Meth.	2	(1,3)	CE 206 Geometrics	2	(1,3)
EM 201 Statics	3	(3,0)	EM 304 Mech. of Mater.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	EM 305 Mech. of Mater. Lab.	1	(0,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1		Phys 222 Opt. and Mod. Phys.	3	(3,0)
			Phys 224 Modern Phys. Lab.	1	(0,3)
	16		AS or MS or Elective	1	
				18	
JUNIOR YEAR					
CE 301 Introd. to Struc. Sc.	3	(2,2)	CE 302 Struc. Desn. I	3	(2,2)
CE 320 Conc. & Bit. Matls.	2	(1,3)	CE 310 Trans. Engr.	4	(3,2)
CE 331 Soil Mechanics	3	(2,2)	Econ 201 Principles of Econ.	3	(3,0)
CE 341 Environ. Engr.	3	(3,0)	EE 330 Systems I	2	(2,0)
EM 202 Dynamics	3	(3,0)	EE 331 Elect. Cir. Wksp.	2	(0,4)
Math Elective	3		Free Elective	3	
	17			17	
SENIOR YEAR					
CrE 310 Introd. to Mat. Sc.	3	(3,0)	CE 402 Struc. Desn. II	3	(3,2)
CE 424 Constru. Meth.	2	(2,0)	CE 425 Engr. Relations	3	(3,0)
EM 320 Fluid Mech.	3	(3,0)	EM 421 Hydrol. & Hyd.	2	(2,0)
EM 322 Fluid Mech. Lab.	1	(0,3)	ME 311 Thermodynamics	3	(3,0)
Earth or Life Sc. Elective	3		Free Elective	3	
Humanistic—Social Elective	3		Tech. Elective	3	
Tech. Elective	3			17	
	18				

138 Total Semester Hours

Each class adviser has a list of approved electives from which student must make selections. Any exception to this list must have the written approval of the department head.

ELECTRICAL ENGINEERING

Electrical engineering is the largest and most diversified of the engineering disciplines. Its technical society membership is more than double that of any other and the responsibilities of the profession range from highly analytical problem solving to detailed design of electronics, communications and computing systems. Electrical engineers have traditionally occupied key positions in a wide variety of engineering programs and their educational program must be structured to allow for this diversity of career objectives. The Electrical Engineering Department allows this flexibility of course selection in its curriculum. A liberal number of humanistic-social electives provide the graduate with the ability to address himself to both the "how" and the "why" of engineering.

The flexibility of the curriculum allows either a sampling from the many aspects of Electrical Engineering or a concentration in a specific area. The student's interests and career objectives are carefully considered by the Electrical Engineering advising staff in structuring a program of study.

Electrical Engineering can be subdivided into the rather broad areas of networks and systems analysis, communications, electronics, computer science, and power. A brief discussion of each of these follows.

Systems and electric network analysis provides the fundamental core materials in the curriculum. These 18 credits of required work constitute the fundamental studies in analysis and experimentation which receive subsequent further development in elective courses. Computer simulation, mathematical modeling, experimental design and scientific reasoning are representative of the topics covered.

Computers, both analog and digital, are studied extensively in the Electrical Engineering program. Few areas in engineering present the promise of continued growth that is offered by the computing industry. In preparing the student to meet this challenge, the department offers courses in real time computing, computer language structures, the theory and design of digital computers, computation and simulation of physical systems, information processing and data handling. The department operates its own digital and analog computing laboratories and has remote terminal equipment to the University Computer Center.

The study of electronics continues to be one of the most active professional areas in Electrical Engineering. Changes in this field have occurred so rapidly that equipment designed five years ago is obsolete by present design criteria. The vacuum tube gave way to the transistor 15 years ago and just recently the integrated circuit has replaced the discrete solid state device. The Electrical Engineering curriculum includes basic work in the theory of operation of solid state devices, the design of solid state circuits and the study of integrated circuit technology. Electronic laboratories within the department contain the most modern equipment available for the study of these devices, including special microscopic and micromanipulation equipment needed in the study of minute integrated circuits.

The study of power systems analysis and energy conversion is carried out in a recently renovated power laboratory. This new facility contains the machinery and instrumentation necessary to explore solid-state-static motor control, dynamic speed and torque measurement techniques and power system stability.

Communication theory may be the most comprehensive field of specialization found in Electrical Engineering. It includes course work in information theory, electromagnetic theory, switching circuits and electronics. Engineers working in communication find themselves studying switching equipment in tele-communications, working on the plasma blackout problem in missile re-entry, studying the design implications of complex missile detection and defense systems or they may be designing antennas and transmitting equipment for space satellites. Some will be trying to comprehend the nature of bioelectricity by studying the human brain.

The Honors Program in the Department of Electrical Engineering has for the past four years accounted for a large percentage of the honors students in the University. All qualified Electrical Engineering students are strongly urged to take advantage of this program since it will provide them with an opportunity to participate in some uncommonly rewarding educational experiences during their final two years of study. Honors students receive individualized professional guidance and special laboratory privileges in many of their courses. Honors students in the past have designed electronic devices, have written complex computer programs and have studied technical material which ordinarily would be reserved for students at the graduate level. Students are asked to contact their Electrical Engineering adviser for more information.

ELECTRICAL ENGINEERING CURRICULUM

(See page 172 for *Freshman Year*)

First Semester			*Second Semester*		
Sophomore Year					
EE 298 Digital Computation	1	(1,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Phys 221 Thermal and Elec. Phen.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Technical/Humanistic—Social Elective*†	3	(3,0)
Humanistic—Social Elective*	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			15	
Junior Year					
EE 320 Electronics I	2	(2,0)	EE 321 Electronics II	2	(2,0)
EE 325 Electronics and Electromagnetics Lab. I	1	(0,2)	EE 326 Electronics and Electromagnetics Lab. II	1	(0,2)
EE 329 Logic & Comput. Devices	3	(2,2)	EE 332 Systems II	2	(2,0)
EE 330 Systems I	2	(2,0)	EE 333 Elec. Circuits W'shop II	2	(0,4)
EE 331 Elec. Circuits Workshop I	2	(0,4)	EE 341 Elec. & Magnetic Fields II	2	(2,0)
EE 340 Elec. and Mag. Fields I	2	(2,0)	Humanistic—Social Elective*	3	(3,0)
Math 309 Engineering Math II	3	(3,0)	Technical Elective†	3	(3,0)
Technical Elective†	3	(3,0)	Free Elective	3	(3,0)
	18			18	
Senior Year					
EE 410 Systems III	3	(3,0)	EE 450 Systems IV	3	(3,0)
EE 411 Elec. Sys. Workshop III	2	(0,4)	EE 451 Systems Design W'shop IV	2	(0,4)
EE 422 Electronics III	2	(2,0)	Humanistic—Social Elective*	3	(3,0)
Technical Electives†	9	(9,0)	Technical Elective	9	(9,0)
Free Elective	3	(3,0)		17	
	19		138 Total Semester Hours		

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* A list of approved humanistic social electives is available from the student's adviser. Any exceptions to this list must be approved in writing by the department head.

† A minimum of 6 credits with Electrical Engineering designations are required among the technical electives. A distribution among the engineering sciences of not less than 9 credits is also required.

INDUSTRIAL ENGINEERING*

INDUSTRIAL ENGINEERING CURRICULUM*

First Semester			*Second Semester*		
Junior Year					
EM 304 Mech. of Materials	3	(3,0)	EE 307 Basic Elec. Engr.	3	(3,0)
EM 305 Mech. of Mat. Lab.	1	(0,3)	EE 309 Elec. Engr. Lab.	1	(0,2)
IE 301 Process Planning I	3	(2,3)	EM 202 Dynamics	3	(3,0)
IE 304 Methods & Standards	3	(2,3)	IE 306 Process Planning II	3	(2,3)
Math 313 Stat. Th. & Meth. I	3	(3,0)	IE 407 Ind. Applic. of Statis.	3	(2,3)
ME 311 Thermodynamics	3	(3,0)	ME 304 Heat Transfer	3	(3,0)
MetE 302 Gen. Metallurgy	3	(2,3)	Humanistic—Social Elective	3	
	19			19	
Senior Year					
EE 308 Basic Elec. Engr.	3	(3,0)	IE 404 Engr. Econ. Anal.	3	(3,0)
EE 310 Elec. Engr. Lab.	1	(0,2)	IE 408 Plant Design	2	(1,3)
EM 320 Fluid Mechanics	3	(3,0)	IE 411 Work Flow Sys. & Contr.	3	(3,0)
IE 412 Seminar	1	(1,0)	IE 413 Seminar	1	(1,0)
ME 315 Kinematics of Mech.	3	(2,3)	ME 481 Methods of O.R. II	3	(3,0)
ME 480 Methods of O.R. I	3	(3,0)	Approved Elective	3	
Approved Elective	3		Humanistic—Social Elective	3	
Humanistic—Social Elective	3			18	
	20				

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* This program to be discontinued. No new students admitted after January 1966.

Each class adviser has an up-to-date list of approved electives. Students must select their electives from this list. Any exceptions to list must be approved in writing by the department head.

MECHANICAL ENGINEERING

Mechanical engineers are involved in a variety of industries: aerospace, machinery, textile, chemical, automotive, appliance, and many others. Therefore, their education must be rather broad and not overly specialized. It begins with a thorough preparation in the basic sciences: mathematics, chemistry and physics. This is followed by rigorous study of the engineering sciences: electrical sciences, thermal sciences, mechanical sciences, computers, and systems engineering which is a generalized treatment of automatic control systems.

The program is designed to develop technical competence in the three broad technical areas of Thermal Science, Mechanical Design and Systems Engineering.

The thermal sciences are concerned with energy conversion and heat transfer. The chemical energy of fuels may be converted to other more useful forms to propel high-speed jet aircraft, to provide the thrust for space vehicles, or to operate refrigeration or air conditioning systems. The thermal sciences also involve fluid flow phenomena: supersonic flow, aerodynamics, and flow through turbomachinery.

Mechanical design requires a knowledge of the strength of materials; mechanisms for converting motion; stress, strain, and deflection analyses; automatic control; lubrication theory; and other engineering sciences. It involves the application of the basic and engineering sciences to the creative design of a wide variety of new devices and systems from prosthetic devices for the handicapped to completely automated machines for manufacturing plants.

Systems engineering is an outgrowth of automatic control theory. It involves instrumentation, and both analog and digital computers for the mathematical and experimental analyses of complex physical systems. These systems may be made up of various mechanical, electrical, and hydraulic components. It is the engineering science upon which the field of automation is based.

All of the mechanical engineering laboratories and mechanical design rooms at Clemson are modern and well equipped. A new Analog Computer Laboratory has recently been developed as well as a new Instrumentation Laboratory. All research activities in the department are housed in a new, modern, air-conditioned laboratory building.

In order that mechanical engineering students may obtain a well-rounded education, approximately one-fifth of the program is devoted to subjects in the arts and humanities. Thus, with a broad education in the basic sciences, engineering sciences, and in the humanities, mechanical engineering graduates are prepared for careers in industry, research, development, mechanical design, management or further graduate study.

The Mechanical Engineering Department offers work leading to the Master of Science and the Doctor of Philosophy degrees as well as to the Bachelor of Science degree.

MECHANICAL ENGINEERING CURRICULUM

(See page 172 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
EM 201 Statics	3	(3,0)	EM 202 Dynamics	3	(3,0)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math I	4	(5,0)
ME 201 Engr. Design	3	(2,3)	Math 313 Statistics	3	(3,0)
or Math 313 Statistics	3	(3,0)	or ME 201 Engr. Design	3	(2,3)
ME 299 Digital Comp.	1	(0,3)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	Phys 224 Engr. Phys. Lab.	1	(0,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

JUNIOR YEAR

EE 330 Systems I	2	(2,0)	EE 332 Systems II	2	(2,0)
EE 331 EE Workshop	2	(0,4)	ME 304 Heat Transfer	3	(3,0)
EM 304 Mech. of Maters.	3	(3,0)	ME 312 Engr. Thermo. II	3	(3,0)
EM 320 Fluid Mech.	3	(3,0)	ME 314 Engr. Exp.	2	(1,2)
ME 311 Engr. Thermo. I	3	(3,0)	ME 316 Dynamic Sys. Anal.	4	(3,3)
ME 313 Inst. & Meas.	2	(1,2)	ME 321 Fluid Dynamics	3	(3,0)
Free Elective	3			17	
	18				

SENIOR YEAR

CrE 310 Material Sci.	3	(3,0)	ME 402 Engr. Design	3	(1,6)
ME 401 Prin. of Engr. Des.	3	(3,0)	ME 414 ME Lab.	1	(0,2)
ME 404 Automatic Control	3	(3,0)	Electives	9	
ME 413 ME Lab.	1	(0,2)	Free Elective	3	
Electives	6			16	
	16				

138 Total Semester Hours

Elective Policy

12 hours must be Humanistic-Social Electives.
9 hours must be Technical Electives.
Each class adviser has a list of approved electives.

METALLURGICAL ENGINEERING CURRICULUM †

JUNIOR YEAR

First Semester			*Second Semester*		
Ch 313 Quan. Anal.	3	(3,0)	ChE 331 Chem. Engr. Thermo.	3	(3,0)
Ch 317 Quan. Anal. Lab.	1	(0,3)	Ch 332 Phys. Chemistry	3	(3,0)
Ch 331 Phys. Chemistry	3	(3,0)	Ch 340 Phys. Chemistry Lab.	1	(0,3)
Ch 339 Phys. Chemistry Lab.	1	(0,3)	EE 308 Basic Elec. Engr.	3	(3,0)
EE 307 Basic Elec. Engr.	3	(3,0)	EM 304 Mechanics of Mats.	3	(3,0)
Math 313 Stat. Th. & Meth. I	3	(3,0)	EM 305 Mech. of Mats. Lab.	1	(0,3)
MetE 301 Phys. Metallurgy	3	(2,3)	MetE 304 Physical Metallurgy	3	(2,3)
Non-Technical Elective*	3		MetE 320 Mech. Metallurgy	2	(2,0)
	20			19	

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† This program to be discontinued. No new students admitted after January 1968.

SENIOR YEAR

First Semester			*Second Semester*		
CrE 410 Analytical Processes	3	(2,3)	MetE 408 Heat Treating	3	(2,3)
CrE 419 Science of Engr. Mats.	3	(3,0)	MetE 425 Senior Thesis	2	(0,6)
ChE 430 Chem. Engr. Thermo.	3	(3,0)	MetE 450 Metallic Corrosion	3	(2,3)
MetE 402 Metallurgical Lit.	1	(0,3)	Non-Technical Electives[*]	6	
MetE 430 Powder Metallurgy	3	(2,3)	Technical Elective[*]	3	
Non-Technical Electives[*]	6				
	19			17	

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[*] Class advisers have an up-to-date list of approved electives and will suggest course sequences. A minimum of nine credits in the humanities or social sciences must be elected. Any exception to the courses on the list must be approved by the department head.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

The programs of the College of Industrial Management and Textile Science embrace three major areas, teaching, research, and public service. The College is responsible for six graduate programs (two in cooperation with other administrative units), seven undergraduate programs, and a "non credit" series of professional development courses for business and industry. The undegraduate curriculums are in the areas of Accounting, Administrative Management, Economics, Financial Management, Industrial Management, Textiles, and Textile Chemistry. These curriculums are designed to prepare the students for a variety of careers, as well as to furnish an education on which to build for a lifetime. The curriculums recognize the need for an understanding of the basic principles of science and appreciation for the nature of human beings, and the comprehension of the economic, political, and social environment. Flexibility in course selection and choice of areas for emphasis is made possible by secondary concentrations and minors as indicated.

ACCOUNTING

This curriculum leads to the Bachelor of Science degree in Accounting. The program of courses is designed to prepare students for professional careers in accounting and management. The major study of accounting is well supported by sequential courses in English, mathematics, management, economics, and sociology.

The graduate in Accounting is well prepared for entrance in law school, graduate school, or the practice of accountancy, either public, private, or governmental. The study of Accounting in preparation for a career in other areas of Management will provide mastery over an essential tool which reinforces experience and judgment in the decision-making process.

ACCOUNTING CURRICULUM

First Semester			*Second Semester*		
FRESHMAN YEAR					
Engl 101 English Composition	3	(3,0)	Acct 201 Principles of Acct.	3	(3,0)
Hist 104 Western Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	
SOPHOMORE YEAR					
Acct 202 Principles of Acct.	3	(3,0)	Acct 301 Intermediate Acct.	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Comp Sc 205 Comp. Prog.	3	(2,3)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Math 207 Multidim Cal.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Soc 201 Introd. to Soc.	3	(3,0)	IM 201 Introd. to IM	3	(3,0)
AS or MS or Elective	1		Math 313 Stat. Methods I	3	(3,0)
	16		AS or MS or Elective	1	
				19	
JUNIOR YEAR					
Acct 302 Intermediate Acct.	3	(3,0)	Acct 305 Income Taxation	3	(3,0)
Acct 303 Cost Acct.	3	(3,0)	Engl 304 Advanced Comp.	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 313 Commercial Law	3	(3,0)
IM 306 Corporation Finan.	3	(3,0)	Mgt Sc 311 Econometrics	3	(3,0)
IM 312 Commercial Law	3	(3,0)	Soc 351 Industrial Soc.	3	(3,0)
Approved Elective	3		Approved Elective	3	
	18			18	
SENIOR YEAR					
Acct 405 Adv. Fed. Tax	3	(3,0)	Acct 407 Acct. Research	1	(1,0)
Acct 410 Bud. and Exec. Cont.	3	(3,0)	Acct 415 Auditing	3	(3,0)
Acct 411 Advanced Acct.	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Mgt Sc 414 Stat. Analysis	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)
Approved Elective	3		IM 415 Mgt. Dec. Making	3	(3,0)
	15		Approved Elective	3	
				16	

132 Total Semester Hours

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* Science elective includes any natural or physical science.

ADMINISTRATIVE MANAGEMENT

The Bachelor of Science degree in Administrative Management is designed for those students interested in careers as professional managers in the less technical areas of management. Such areas include marketing, personnel administration, purchasing, public administration at the local, state and national levels, and other administrative activities. In addition, the qualified graduate of this curriculum will have a background suitable for pursuing graduate study in such areas as marketing, transportation, finance, and economics, as well as the behavioral sciences.

The programs of study included in Administrative Management curriculum is designed to provide the student with (1) an appreciation of the social, political and economic environments in which business firms must operate, (2) knowledge of the functional areas of business, their interrelationship and use of analytical methods in solving problems and (3) some facility in the use of mathematics, statistics, and the behavioral sciences in managing administrative activities.

ADMINISTRATIVE MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chem.*	4	(3,3)	Ch 102 General Chem.*	4	(3,3)
or Acct 201 Prin. of Acct.	3	(3,0)	or Acct 202 Prin. of Acct.	3	(3,0)
Engl 101 English Comp.	3	(3,0)	Engl 102 English Comp.	3	(3,0)
Hist 104 Western Civilization	3	(3,0)	Math 102 Math Analysis II	3	(3,0)
Math 101 Math Analysis I	3	(3,0)	Pol Sc 101 Introd. to Pol. Sci.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	14 or 13			14 or 13	

SOPHOMORE YEAR

Acct. 201 Prin. of Acct.	3	(3,0)	Acct 202 Prin. of Acct.	3	(3,0)
Econ 201 Prin. of Econ.	3	(3,0)	or Phys 202 Gen. Physics*	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Phys 204 Gen. Phys. Lab.*	1	(0,3)
or Engl 204 Surv. of Engl. and Amer. Lit.	3	(3,0)	Econ 202 Prin. of Econ.	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	IM 201 Introd. to Mgt.	3	(3,0)
or Phys 201 Gen. Physics*	3	(3,0)	IM 299 Computer Prog. I	1	(0,3)
Phys 203 Gen. Phys. Lab.*	1	(0,3)	Psych 201 Introd. to Psych.	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Soc 202 Social Problems	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16 or 17			17 or 18	

JUNIOR YEAR

Acct 303 Cost Accounting	3	(3,0)	Econ 302 Money and Banking	3	(3,0)
Econ 301 Econ. of Labor	3	(3,0)	Engl 304 Adv. Composition	3	(3,0)
IM 304 Quality Control	3	(3,0)	IM 307 Personnel Mgt.	3	(3,0)
IM 306 Corporate Fin.	3	(3,0)	IM 313 Coml. Law	3	(3,0)
IM 312 Coml. Law	3	(3,0)	Pol Sc 321 Gen. Public Adm.	3	(3,0)
Pol Sc 201 Introd. to Pol. Sc. II	3	(3,0)	Elective†	3	
	18			18	

SENIOR YEAR

Acct 410 Exec. Budget & Con.	3	(3,0)	IM 402 Prod. Plan. & Cont.	3	(3,0)
IM 401 Marketing Anal.	3	(3,0)	IM 409 Mgt. Simulation	1	(0,3)
IM 405 Econ. of Trans.	3	(3,0)	IM 411 Marketing Research	2	(2,0)
Soc 331 Urban Sociology	3	(3,0)	or IM 407 Dir. Research	1	(1,0)
Elective†	6		IM 412 Marketing Anal. II	3	(3,0)
			IM 415 Manag. Dec. Making	3	(3,0)
	18		Elective†	5 or 6	
				17	

132 Total Semester Hours

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* A student may elect either Chemistry or Physics to meet the degree's physical science requirement. If he elects Chemistry he will take Acct 201 and 202 in the sophomore year. If he elects Physics he will take Acct 201 and 202 in the freshman year and Phys 201, 202, 203 and 204 in his sophomore year.

† If a student *does not* elect to take Basic ROTC, he may complete the 4 hours of elective credit at any time during his freshman or sophomore year.

ECONOMICS

The curriculum leading to the Bachelor of Arts degree in Economics is designed to combine a broad general education with a thorough understanding of economics.

The economics curriculum is administered in the College of Industrial Management and Textile Science. Although separate and distinct from the Bachelor of Arts program in the College of Liberal Arts, it shares several ingredients with that program. The two programs share an identical freshman year sequence, identical minor concentrations in most cases, and many of the same approved electives.

The degree requirements, effective for freshmen entering 1967-1968 and thereafter, are given below. The Bachelor of Arts degree in Economics requires 128 semester hours for graduation; and whenever scheduling permits, the student will be required to take the courses in the sequence given. The curriculum shown, however, can be considered adequate preparation for graduate study in economics only if it is taken with the mathematics minor.

ECONOMICS CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Math 101 Math. Anal. I[*]	3	(3,0)	Math 102 Math. Analysis II[*]	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Natural Science[†]	4		Natural Science[†]	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

Sophomore Year

Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Math 203 Elem. Stat. Inference[*]	3	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			17	

Junior Year

Acct 201 Prin. of Accounting	3	(3,0)	Econ 407 Natl. Income and Empl. Anal.	3	(3,0)
Econ 314 Intermed. Econ. Theory	3	(3,0)			
Humanities[‡]	3		Humanities[‡]	3	
Major	3		Major	3	
Minor[§]	3		Minor[§]	6	
	15			15	

Senior Year

Major	6	Major	6
Minor	6	Approved Electives[¶]	10
Approved Elective[¶]	3		
	15		16

128 Total Semester Hours

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[*] The sequence of Math 101, 102, 203, and 106 may be replaced by Math 106, 205, and 313 or by Math 106, 205, and Ex St 301.

[†] Election of a two-semester sequence of the same science is required.

[‡] Courses for the Humanities requirement may not be selected from the minor field. Humanities include Art, English, Foreign Language, Music, Philosophy and Religion.

[§] Where the student selects a minor which carries prerequisites, the prerequisite courses will be counted as approved electives.

[¶] Those seeking teacher certification will be required to complete more than 128 semester hours.

Twenty-four semester hours above the sophomore level are required including Econ 314 and Econ 407. Courses must also include 9 semester hours selected from Econ 302, 403, 404, 410, 412 and

420. The remaining hours may be selected from Econ 301, 302, 305, 306, 308, 309, 403, 404, 410, 412, 416, 420, 421, 422, 424, Ex St 462, Mgt Sci 311, IM 404, 405, 406, and Ag Ec 456. (Econ 314 should be scheduled to follow immediately after Econ 202.)

Minor Concentration

A major in economics must select a secondary (minor) concentration from the following:

- Accounting (to include Acct 202, 301, 302, 303, 410)
- Biology
- Chemistry
- English
- Geology
- History
- Mathematics
- Modern Languages
- Philosophy
- Physics
- Political Science
- Psychology
- Sociology

Students who consider the Bachelor of Arts curriculum in Economics and desire to go into secondary school teaching may elect to take the degree in Education with a teaching area in Economics. The courses will be those required for teaching certificates as specified by the South Carolina Department of Education as well as those economics courses required for an Economics major.

Specific requirements for most minors may be found under the section on the College of Liberal Arts and the College of Physical and Mathematical Sciences, Bachelor of Arts curriculum. Requirements for a major in Education with a teaching area in Economics are shown under the College of Education.

A minor in Economics is provided for other degree programs consisting of 15 hours above the sophomore level which must include Econ 314 and 407.

Approved Electives

A list of approved electives for both degree and quality requirements may be obtained from the departmental secretary or from an adviser.

FINANCIAL MANAGEMENT

The curriculum for the Bachelor of Science degree in Financial Management provides the student with a course of study in preparation for a career in such areas as banking, insurance, brokerage and related activities. The student should be well prepared to serve on the financial staff of practically any business firm for the purpose of planning, providing, and controlling the capital of the firm. This curriculum should also prepare the student for service in government and agencies and programs of government. The graduate with this degree should be adequately prepared for entrance in law or graduate school.

The course work consists largely of courses in English, Mathematics, Accounting, Economics, Management, and the Social Sciences. The special interests of the individual student may be pursued through elective credit.

FINANCIAL MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Acct 201 Prin. of Acct.	3	(3,0)	Acct 202 Prin. of Acct.	3	(3,0)
Engl 101 English Comp.	3	(3,0)	Engl 102 English Comp.	3	(3,0)
Hist 104 Western Civilization	3	(3,0)	Math 102 Math Analysis II	3	(3,0)
IM 201 Introd. to IM	3	(3,0)	Phil 202 Logic	3	(3,0)
Math 101 Math Analysis I	3	(3,0)	Pol Sc 101 Introd. to Pol. Sci.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

Acct 301 Intermediate Acct.	3	(3,0)	Acct 302 Intermediate Acct.	3	(3,0)
Econ 201 Prin. of Econ.	3	(3,0)	Econ 202 Prin. of Econ.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Am. Lit.	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	IM 299 Computer Prog. I	1	(0,3)
Soc 201 Introd. Soc.	3	(3,0)	Psych 201 General Psych.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			14	

JUNIOR YEAR

Acct 303 Cost Acct.	3	(3,0)	Acct 305 Income Taxation	3	(3,0)
Econ 306 Risk & Insurance	3	(3,0)	Econ 302 Money and Banking	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 306 Corp. Finance	3	(3,0)
Engl 304 Adv. Composition	3	(3,0)	IM 307 Personnel Mgt.	3	(3,0)
IM 312 Coml. Law	3	(3,0)	IM 313 Coml. Law	3	(3,0)
Soc 351 Indus. Soc.	3	(3,0)	Elective	3	(3,0)
	18			18	

SENIOR YEAR

Acct 410 Bud. & Exec. Cont.	3	(3,0)	Acct 415 Auditing	3	(3,0)
Econ 422 Monetary Theory	3	(3,0)	Econ 412 Interna. Trade	3	(3,0)
IM 401 Marketing Anal.	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
IM 415 Managl. Dec. Making	3	(3,0)	IM 409 Mgt. Simulation	1	(0,3)
Elective	6	(6,0)	Elective	6	(6,0)
	18			16	

132 Total Semester Hours

INDUSTRIAL MANAGEMENT

This curriculum is designed to adequately prepare students for positions of major responsibility in industry, business, government or further academic study. During the first year education in the mathematical and physical sciences is emphasized. In the second, third, and senior years the student's work expands into the areas of industrial engineering, finance, management and the social sciences. As preparation for careers in professional management, the Industrial Management curriculum is predicated on the philosophy that the individual must manage first himself, coupling this objective with the acquisition of a general education and then acquiring a mastery of the "tools" of management.

INDUSTRIAL MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 Gen. Chemistry	4	(3,3)	Ch 102 Gen. Chemistry	4	(3,3)
EG 103 Engr. Com.	3	(1,6)	Phys 122 Mech. and Wave Phen.	3	(3,0)
or Hist 104 Western Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 104 Hist. of West. Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	or EG 103 Engr. Com.	3	(1,6)
IM 100 Introd. to IM	0	(1,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			18	

SOPHOMORE YEAR

Acct 201 Prin. of Accounting	3	(3,0)	Acct 202 Prin. of Accounting	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Math 207 Multi. Dim. Cal.	3	(3,0)	IM 201 Introd. to IM	3	(3,0)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	IM 299 Computer Pro. I	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Engl 203 Survey of Engl. Lit.	3	(3,0)
Soc 201 Introd. to Soc.	3	(3,0)	or Engl 204 Surv. of Engl. and Amer. Lit.	3	(3,0)
AS or MS or Elective	1	(2,1)	Math 313 Stat. Methods I	3	(3,0)
	17		AS or MS or Elective	1	(2,1)
				17	

JUNIOR YEAR[*]

Acct 303 Cost Accounting	3	(3,0)	Engl 304 Adv. Composition	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 304 Quality Control	3	(3,0)
IE 307 Survey of Engr.	3	(3,0)	Mgt Sc 311 Introd. to Econ.	3	(3,0)
IM 322 Legal Env. of Bus.	3	(3,0)	Soc 351 Indus. Soc.	3	(3,0)
Area Concentration	3		Area Concentration	3	
American Studies Elective[†]	3		Humanities Elective[‡]	3	
	18			18	

SENIOR YEAR

Acct 410 Bud. and Exec. Cont.	3	(3,0)	IM 402 Prod. Plan. and Cont.	3	(3,0)
IM 401 Marketing Analysis	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)
IM 408 Work Simp. & Stand.	3	(2,3)	IM 407 Directed Research[§]	1	(1,0)
Mgt Sc 414 Stat. Analysis	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Area Concentration	3		IM 415 Mgt. Dec. Making	3	(3,0)
			IM 499 Computer Prog. II[§]	1	(0,3)
	15		Area Concentration	3	
				14	

132 Total Semester Hours

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[*] Industrial Management majors are expected to begin their area concentrations in the junior year.

[†] *American Studies Elective.* A student selects one 3 credit course from Hist 101, 102, 301, 313, 314, or Pol Sc 202, 301, 302, or he may elect to take an additional 3 hours in his area concentration with approval of his class adviser.

[‡] *Humanities Elective.* A student selects one 3 credit course from any English, Architecture, Music, Humanities, Psychology, or Philosophy course for which he is eligible or he may elect to take an additional 3 hours in his area concentration with approval of his class adviser.

[§] Students electing Accounting as their area concentration may substitute Acct 403 for IM 499 and IM 407. Students electing the Marketing concentration may substitute IM 410 for IM 407.

Area Concentrations

During the junior and senior years the student is required to select courses from *one* of the following areas for the purpose of emphasizing a particular area of the curriculum. Area concentrations constitute 12 credits and may be extended to 18 credits with the approval of the student's major adviser.

A. Ceramics
B. Economics
C. Health and Hospital Administration
D. Industrial Engineering
E. Industrial Statistics
F. Management Science
G. Marketing Analysis
H. Mathematics
I. Personnel Management
J. Regional Science
K. Textile Chemistry
L. Textile Science

TEXTILE CHEMISTRY

The Textile Chemistry curriculum is designed to prepare students for a variety of positions in the textile fiber, finishing, and related industries. This program also constitutes an excellent foundation for graduate study. During the first two years, the student acquires a firm knowledge of chemistry, physics, and mathematics. In the third and fourth years, this basic knowledge is applied to areas of more specific interest to the textile industry. These include fabric and fiber formulation, dyeing and finishing, color science, textile unit operations, and textile instrumentation. Supporting courses in the humanities, English, statistics, quality control, and fiber science are also included.

In addition to the prescribed course work, senior students are encouraged to participate in original research and seminar programs. These programs carry academic credit and serve to introduce the students to the methodology of textile research and development.

The Textile Department also offers the degree of Master of Science in Textile Chemistry and, in conjunction with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

TEXTILE CHEMISTRY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 104 Hist. of West. Civilization	3	(3,0)	IM 299 Comp. Program. I	1	(0,3)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Text 122 Introd. Textiles	1	(1,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

Sophomore Year

Ch 223 Organic Chemistry	3	(3,0)	Ch 219 Chemistry Principles	2	(2,0)
Ch 225 Org. Chem. Lab.	2	(0,6)	Ch 224 Organic Chemistry	3	(3,0)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Ch 226 Org. Chem. Lab.	2	(0,6)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

Junior Year

Ch 331 Physical Chemistry	3	(3,0)	Ch 313 Quan. Anal.	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Ch 315 Quan. Anal. Lab.	2	(0,6)
Math 313 Stat. Theory & Methods	3	(3,0)	Ch 332 Physical Chemistry	3	(3,0)
TC 315 Introd. Poly. Sci. & Engr.	3	(3,0)	TC 316 Chem. Prep. of Text.	3	(2,3)
TC 317 Pol. & Fib. Lab.	1	(0,3)	Text 306 Yarn Structure II	3	(2,3)
Text 305 Yarn Structure I	3	(2,3)	Elective	3	
	16			17	

Senior Year

Engl 304 Adv. Composition	3	(3,0)	TC 458 Dyeing & Fin. II	3	(3,0)
TC 457 Dyeing & Fin. I	3	(3,0)	TC 460 Dyeing and Fin. Lab.	1	(0,3)
TC 459 Dyeing and Fin. Lab.	1	(0,3)	Text 313 Fabric Structure I	3	(2,3)
TC 466 Text. Unit Operations	3	(3,0)	Text 322 Prop. of Text. Structure	3	(2,3)
Text 321 Fiber Science	3	(2,3)	Text 426 Instrumentation	3	(3,0)
Elective	3		Text 440 Color Science	3	(2,3)
	16		Elective	2	
				18	

132 Total Semester Hours

TEXTILE SCIENCE

The Textile Science curriculum prepares the bachelor's degree candidate in basic science and textile technology. The first two years are devoted primarily to the study of chemistry, physics, mathematics and English. In his third and fourth years, the student is introduced to the basic and applied science and technology necessary for development and production of fibers, woven textiles, nonwoven textile systems, and synthetic polymers.

The curriculum prepares the candidate for research and development work as well as for positions in production, standards, and management in the polymer and textile or related industries and for graduate study in Textile Science, engineering, polymer science, and other related branches of science and engineering.

The Textile Department also offers graduate programs in polymer and textile science and engineering.

TEXTILE SCIENCE CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 104 Hist. of West. Civilization	3	(3,0)	IM 299 Comp. Program. I	1	(0,3)
Math 106 Cal. of One Var.*	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Text 122 Introd. Textiles	1	(1,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

Engl 203 Survey of Eng. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	TC 304 Text. Chemistry	3	(3,0)
TC 303 Text. Chemistry	3	(3,0)	TC 306 Text. Chem. Lab.	1	(0,3)
TC 305 Text. Chem. Lab.	1	(0,3)	Text 202 Fiber Processing II	3	(2,3)
Text 201 Fiber Processing I	3	(2,3)	AS or MS or Elective	1	
AS or MS or Elective	1			16	
	19				

JUNIOR YEAR

Econ 201 Principles of Econ.	3	(3,0)	Acct 201 Prin. of Accounting	3	(3,0)
Math 313 Stat. Theory & Methods	3	(3,0)	IM 304 Quality Control	3	(3,0)
Text 303 Fiber Processing III	3	(2,3)	Text 304 Fiber Processing IV	3	(2,3)
Text 311 Fabric Development I	3	(2,3)	Text 312 Fabric Development II	3	(2,3)
Text 321 Fiber Science	3	(2,3)	Text 322 Prop. of Text. Struct.	3	(2,3)
Elective	3			15	
	18				

SENIOR YEAR

Engl 304 Adv. Composition	3	(3,0)	TC 458 Dyeing and Fin. II	3	(3,0)
TC 315 Introd. Poly. Sci. & Engr.	3	(3,0)	TC 460 Dyeing and Fin. Lab.	1	(0,3)
TC 317 Poly. & Fib. Lab.	1	(0,3)	Text 412 Fabric Dev. IV	3	(2,3)
Text 411 Fabric Development III	3	(2,3)	Text 426 Instrumentation	3	(3,0)
Text 414 Nonwoven & Knit Struct.	3	(3,0)	Text 440 Color Science	3	(2,3)
Text 421 Text. Costing	3	(2,3)	Elective	3	
	16			16	
			132 Total Semester Hours		

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* Effective 1969-1970.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts, in addition to its six major curriculums leading to the degree of Bachelor of Arts, furnishes indispensable services to all other divisions of the University, including nearly all the instruction in the humanities and the social sciences. Major concentrations may be elected in English, History, Modern Languages, Political Science, Psychology, and Sociology; minor concentrations are offered in these disciplines and in Philosophy. In cooperation with other Colleges of the University, minor concentrations are also available in Biology, Chemistry, Economics, Fine Arts, Geology, Mathematics, and Physics. Supporting work is offered in Music and in interdisciplinary humanistic studies.

The College of Liberal Arts offers programs leading to graduate degrees in English and in History.

BACHELOR OF ARTS CURRICULUM

GENERAL INFORMATION

The curriculum leading to the degree of Bachelor of Arts is designed to meet the needs of students who desire a broad general education, with emphasis upon the humanities and the social sciences, as a preparation for intelligent citizenship, for general commercial and industrial life, for government service, and for teaching. This curriculum also provides excellent background for the study of law or journalism.

As soon as feasible in his college career, and not later than the end of his sophomore year, the student seeking the Bachelor of Arts degree will select a major and a minor field of concentration from the following areas:

Major

English
History
Modern Languages
Political Science
Psychology
Sociology

Minor

Biology
Chemistry
Economics
English
Fine Arts
Geology
History
Mathematics
Modern Languages
Political Science
Philosophy
Physics
Psychology
Sociology
"Cluster Minor"

To fulfill requirements for a major concentration, a student takes 24 semester hours credit from courses above the sophomore level, including certain courses specified by the major department; the minor concentration requires 15 credits from courses above the sophomore level, including certain specified courses.

The total number of semester credits required for the degree is 128; of these, at least 12 should be earned in humanities courses numbered 300 or higher, and at least 12 in Social Sciences courses numbered 300 or higher. The humanities are for this purpose considered to include Art, English, Languages, Music, Philosophy, and Religion as well as courses entitled Humanities; the Social Sciences are here considered to include Economics, Geography, History, Political Science, Psychology, and Sociology.

Students in the Bachelor of Arts program who expect to teach in the public schools may elect Education courses required for teaching certificates by the South Carolina State Department of Education, such courses to be approved by their own departmental advisers.

BACHELOR OF ARTS DEGREE

BASIC CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Math 101 Math Analysis	3	(3,0)	Math 102 Math Analysis	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Natural Science*	4	(3,3)	Natural Science*	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

SOPHOMORE YEAR

Engl 203 English Literature	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
Approved Electives	9		Approved Electives	9	
	16			16	

JUNIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	12
Humanities or Social Sciences	3	Humanities or Social Sciences	3
Approved Electives	3 or 6	Approved Electives	3
	15 or 18		18

SENIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	9
Humanities or Social Sciences	3	Humanities or Social Sciences	3
Approved Electives	3 or 2	Approved Electives	2 or 3
	15 or 14		14 or 15

128 Total Semester Hours

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* A two-semester sequence of the same science (Chemistry, Physics, Geology, or Physical Science) *or* Botany 101 and Zoology 101, 103.

MAJOR CURRICULUMS IN THE COLLEGE OF LIBERAL ARTS

ENGLISH

For a *major* concentration in English, the recommended program of study consists of the courses stipulated in the basic curriculum and 24 semester hours of English, arranged as follows:

Group I—Engl 402 or 404, 405, 423 or 424.

Group II—Nine semester credits according to one of the following plans:

(A) Engl 461; 425 or 427; and 416 or 438 or 439.

(B) Engl 462; 409 or 431 or 443; 445 or 446.

(C) Engl 461, 462, and one of these courses: 409, 416, 425, 427, 431, 438, 439, 443, 445.

Group III—Six additional semester credits from courses numbered above 400.*

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required. English majors are expected to complete Hist 361, 363, and to complete the third year of a foreign language or the second year of two foreign languages. Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

HISTORY

The recommended program of study consists of the required courses in the Bachelor of Arts curriculum plus Hist 101, 102, Econ 201, Phil 201 or 312, the completion of the third year of a modern foreign language, Hist 499, and 21 additional semester credits in History, arranged as follows:

Group I—At least six credits from these courses: Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—At least six credits from these courses: Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 482, 483, 484.

Group III—At least six credits from these courses: Hist 331, 332, 340, 341, 342.

History majors become eligible to take Hist 499 when they have completed 96 semester hours and at least 5 courses in history at the 300-400 level (excluding Hist 301).

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

MODERN LANGUAGES

The recommended program for a major concentration in Modern Languages consists of the required courses of the basic Bachelor of Arts curriculum and 24 semester credits in one language or 18 credits in one language and 12 credits in a second language. Only courses numbered higher than 300 may be used to fulfill these requirements.

French majors must take Fr 303, 304, 305, 306; Spanish majors must take Span 303, 304, 305, 306; German majors must take Ger 303, 304, 305, 306.

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* English 332 may be included in this group by special arrangement with the Head of the Department of English.

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

POLITICAL SCIENCE

For a major concentration in Political Science, the recommended program of study consists of the required courses in the Bachelor of Arts curriculum, Pol Sc 201 and either 101 (formerly 202) or 301, and 24 semester hours of Political Science drawn from at least four of these fields:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433, 434
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372, 373

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

PSYCHOLOGY

The recommended program of study for a major concentration in Psychology consists of the required courses in the Bachelor of Arts curriculum, Psych 201 and 202, Math 203, Psych 363, and 21 additional hours of Psychology drawn from the following courses:

Psych 302, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 471, 498, and Comp Sc 205.

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

SOCIOLOGY

The recommended program of study for a major concentration in Sociology consists of the required courses in the Bachelor of Arts curriculum, Soc 201, 202, Econ 201, 202, Phil 201, 202, Pol Sc 301, Ex St 301, Soc 411, 421, and 18 additional hours drawn from these courses: Pol Sc 341, RS 359, Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499. Additional approved electives will be added to meet the minimum of 128 semester hours required for graduation.

MINOR CONCENTRATIONS

Students seeking the Bachelor of Arts degree may choose one of several minor concentrations available. The requirements for each area are detailed below.

Biology. A minor concentration in Biology requires 15 semester credits in the biological sciences in addition to Bot 101 and Zool 101, 103.

Chemistry. A minor concentration in Chemistry requires Ch 101, 102, and 15 additional credits in chemistry, the courses to be selected in consultation with the Department of Chemistry.

Economics. A minor concentration in Economics requires Econ 201, 202, 314, 407, and 9 credits from these courses: Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 311, 404, 405, 406, Ag Ec 456.

English. A minor concentration in English requires 15 semester credits in English above the sophomore level, arranged as follows:

Group I—Engl 405 and either 423 or 424.

Group II—One of these courses: Engl 402, 404, 425, 427, 431, 443, 461, 462.

Group III—Six additional credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts consists of Hum 201-202 or Arch 101-102 and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no fewer than 6 in any discipline selected:

Arch 315, 316, 402, 415, 416, 511, 512;
Engl 305, 311, 331, 332, 333;
Mus 151, 152, 310, 315, 316, 362, 365, 405, 406, 411;
Phil 305;
Visual Studies (all courses).

Geology. A minor concentration in Geology requires 15 semester credits from the following courses: Geol 201, 203, 204, 205, 306, 307, 309, 311, 402, 403, 404, 411, 412.

History. A minor concentration in History requires Hist 101, 102, and 15 additional credits in History, including at least one course from each of these groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342.

Mathematics. A minor concentration in Mathematics requires Math 106, 205, 206, and 9 additional credits in mathematics, including at least two of these courses: Math 208, 295, 313, Comp Sc

205, 311, and any 400-level course in Mathematics or Computer Science.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300.

Philosophy. A minor concentration in Philosophy requires Phil 201, 202, and 15 semester credits from the following courses: Phil 303, 304, 305, 312, 318, 322, 344, 422, 425, Rel 309.

Physics. A minor concentration in Physics requires Phys 122 and 15 additional semester credits in Physics, including Phys 221, 222.

Political Science. A minor concentration in Political Science requires Pol Sc 101 (formerly 202) or 301; 201, and 15 additional semester credits selected from at least three of the fields of Political Science listed above under the major curriculum for Political Science.

Psychology. A minor concentration in Psychology requires Psych 201, 202, and 15 semester credits from the following courses; Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 498; Ed 302 and 335 (if taken prior to fall 1968); Comp Sc 310.

Sociology. A minor concentration in Sociology requires Soc 201, 202, and 15 semester credits from the following courses: Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499, Pol Sc 341, RS 359.

The "*Cluster Minor.*" This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the "Cluster Minor" is 15 semester credits in courses numbered higher than 300 (except where noted differently), chosen according to one of the plans listed below. Courses within the student's major area may not be included in the Cluster Minor.

Group I—Social Sciences*
- Economics
- History
- Political Science
- Psychology
- Sociology

Group II—Philosophy and Religion

Group III—Administration*
- Economics
- Accounting
- Industrial Management

Group IV—Life Sciences †
- Bacteriology
- Botany
- Genetics
- Zoology

Group V—Physical Sciences †
- Chemistry
- Geology
- Physics

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* At least two courses must be taken in each subject chosen.

† No course in the 100 series is acceptable toward the cluster minor and not more than two courses in the 200 series. At least two courses must be taken in each subject chosen.

APPROVED ELECTIVES FOR STUDENTS IN THE COLLEGE OF LIBERAL ARTS

Class advisers in the College of Liberal Arts will normally approve the following courses as electives, but the Dean of Liberal Arts retains the prerogative of limiting the total number of credits that may be approved in a discipline or area:

All courses offered in the College of Liberal Arts and the College of Physical and Mathematical Sciences except: Ch 450; Engl 111; Geol 406; Phys 460; Psych 211; Math 100, 115, 116, 215, 216;

All courses in Economics;

All courses in Accounting;

Architecture 253, 303, 304, 315, 316, 415, 416, 517-530, to a limit of 12 credits;

Bot 101, 202 (other courses by special arrangement);

Comp Sc 205, 311;

Education courses required for certification in South Carolina (other courses by special arrangement);

Ex St 301, 462;

In Ed 204, 440;

IM 201, 299, 307, 312, 313, 322, 405;

Mgt Sc 311, 413, 414;

RPA 304;

RS 301;

Courses in Visual Studies to a limit of 9 credits;

Zool 101, 103, 301, 302, 304, 460.

SCHOOL OF NURSING

The School of Nursing provides two programs designed to prepare the undergraduate student for a career in nursing.

The program leading to the Bachelor of Science in Nursing degree is designed to prepare nurses for the practice of professional nursing in a variety of settings—hospitals, industry, clinics, and public health agencies. The program offers the foundation for graduate study in nursing, and an unlimited opportunity for men and women for sound career development in professional nursing. The baccalaureate program is four academic years and one six-week summer term in length. The student is enrolled in liberal arts and basic science courses during the first two years. These courses are arranged sequentially in order to provide the foundation for professional courses which are planned for the junior and senior years. In addition advanced liberal arts courses are taken during the junior and senior years. Clinical nursing experiences under the guidance of the School of Nursing faculty will take place with patients in the Greenville Hospital Systems and with local public health agencies.

The program leading to the Associate in Arts degree is designed to prepare technically competent nurses who will practice in hospitals and similar agencies. The clinical nursing experiences, under the guidance of the School of Nursing faculty, take place with patients in the Anderson Memorial Hospital. The program covers two years and one summer session. This is a terminal program.

Students enrolled in the School of Nursing must meet the course requirements as described for each program in order to qualify for the degree and for licensure to practice Nursing.

BACHELOR OF SCIENCE IN NURSING CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Bot 101 General Botany	4	(3,3)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Ch 101 General Chemistry	4	(3,3)	Math 102 Math. Analysis	3	(3,0)
Math 101 Math. Analysis	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Zool 101, 103 Gen. Zoology	4	(3,2)
	17			17	

SOPHOMORE YEAR

Engl 204 Survey of Engl. and American Lit.	3	(3,0)	Ch 310 Elem. Bio-Chem.	4	(3,3)
Ch 220 El. Org. Chem.	4	(3,3)	Micro 301 Gen. Microbiology	4	(3,3)
History (Elective)	3	(3,0)	Nurs 207 Dynamics of Human Relations	3	(2,3)
Psych 201 Gen. Psych.	3	(3,0)	Psych 211 Growth & Develop.	3	(3,0)
Zool 461 Anatomy	3	(3,0)	Soc 201 Introd. to Soc.	3	(3,0)
	16			17	

SUMMER (FIRST SESSION)

Nurs 208 Problem Solving in Nursing	3 (2,3)
Zool 460 Gen. Physiology	3 (2,3)
	6

JUNIOR YEAR

First Semester		*Second Semester*	
Math 203 Elem. Stat. Infer.	3 (3,0)	Nurs 310 Perspectives in Nursing Intervention	3 (3,0)
Nurs 309 Human Values in Nurs.	3 (3,0)	Nurs 312 Nurs. of Acute and Chronically Distressed	4 (1,9)
Nurs 311 Nurs. During Alterations in Life Patterns	4 (1,9)	Nurs 314 Nursing in the Home	3 (2,3)
Nurs 313 The Prom. of Health	3 (2,3)	Soc 311 The Family	3 (3,0)
Soc 202 Social Problems	3 (3,0)	Elective*	3 (3,0)
	16		16

SENIOR YEAR

Nurs 415 Nurs. as a Social Force	3 (3,0)	Nurs 422 Cur. Research in Nurs.	3 (3,0)
Nurs 417 Intensive Nursing	4 (1,9)	Nurs 425 Independent Study in Nursing	7(3,12)
Nurs 419 The Multiprob. Family	3 (2,3)	Psych 302 Social Psychology	3 (3,0)
Nurs 421 Hist. & Philoso. of Nurs.	3 (3,0)	Elective*	3 (3,0)
RS 301 Rural Community	3 (3,0)		
	16		16

137 Total Semester Hours

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* Electives from the following: Humanities, Literature, Philosophy, Music.

Note: Nurs 207 and Nurs 208 open to students enrolled in baccalaureate degree program only. 1.80 grade-point ratio required for registration in courses 300 and above.

ASSOCIATE IN ARTS IN NURSING

First Semester		*Second Semester*	
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Nurs 101 Introd. to Nursing	6 (3,9)	Nurs 102 Acute Illnesses	6(2,12)
Nurs 105 Integrated Science I	4 (3,3)	Nurs 106 Integrated Science II	4 (3,3)
Nutr 103 Prin. of Nutrition	4 (3,3)	Psych 201 Gen. Psychology	3 (3,0)
	17		16

SUMMER SESSION (6 WEEKS)

Nurs 104 Medical-Surgical Nursing I . . . 5 (3,6)

Third Semester		*Fourth Semester*	
Nurs 202 Pediatric Nursing	5 (3,6)	Nurs 201 Psychodynamic Nursing	5 (3,6)
Nurs 206 Medical-Surg. Nurs. II	6 (3,9)	Nurs 204 Mat. and Newborn Care	5 (3,6)
Psych 211 Growth and Develop.	3 (3,0)	Psych 402 Abnormal Psychology	3 (3,0)
Soc 201 Introd. to Soc.	3 (3,0)	Soc 311 The Family	3 (3,0)
	17		16

71 Total Semester Hours

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

The College of Physical and Mathematical Sciences, attuned to the times and its needs, offers six major curriculums leading to the degree of Bachelor of Science. These are Chemistry, Geology, Mathematics, Medical Technology, Physics, and Pre-medicine (Pre-dentistry).

In addition, a curriculum in Arts and Sciences, with a major emphasis in either Chemistry, Geology, Mathematics, or Physics can be pursued. The fulfillment of the requirements of this curriculum results in a Bachelor of Arts degree.

Not only are the departments in the College of Physical and Mathematical Sciences concerned with their own programs but they work closely with the other academic departments in the University.

This interweaving of the physical and mathematical sciences with other disciplines, such as biology, economics, engineering, management, and others, allows a student greater flexibility and responsibility in designing his own program.

BACHELOR OF ARTS CURRICULUM

The curriculum leading to the Bachelor of Arts degree is designed to meet the needs of those students who desire a broad general education. The first two years are spent in introductory work in various areas in order to give the student breadth of view. This type of background enables the student to take a more intelligent part in the selection of his primary and secondary (major and minor) fields of concentration. The major areas in the College of Physical and Mathematical Sciences are Chemistry, Geology, Mathematics, and Physics.

There are a great number of choices in the minor area from the different academic departments in the University. Thus, a student has a larger degree of flexibility and responsibility in designing his curriculum in the Bachelor of Arts program. The secondary (minor) fields are:

Biology
Chemistry
Economics
English
Fine Arts
Geology
History
Mathematics
Modern Languages
Political Science
Philosophy
Physics
Psychology
Sociology

Furthermore, a cluster minor may be taken in place of a secondary field. The cluster minor concentration should consist of 15 semester credits in courses numbered higher than 300 (with some exceptions). The subject area of the major should be excluded from the grouping in the minor. The groups available in the cluster minor are:

Group I—Social Sciences
Group II—Philosophy and Religion
Group III—Fine Arts
Group IV—Administration
Group V—Life Sciences

The major concentration requires 24 semester hours and the secondary (minor) 15 semester hours above the sophomore level unless otherwise indicated. These fit in the basic curriculum for the three upperclass years with minor variations depending on the specific major or minor selected. Consequently, a student not positive of his major or minor field has the advantage of making his decision while in the curriculum with a minimum loss of credit.

MAJOR FIELD OF CONCENTRATION

CHEMISTRY

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

SOPHOMORE YEAR

Ch 223 Organic Chemistry[*]	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 228 Organic Chem. Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Hist 203 History of Civilization	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(5,0)	Phys 221 Thermal & Elec. Phen.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			17	

JUNIOR YEAR

Hist 204 History of Civilization	3	(3,0)	Chemistry Major	4	
Chemistry Major	4		Minor	6	
Minor	3		Elective	8	
Elective	7				
	17			18	

SENIOR YEAR

Chemistry Major	4		Chemistry Major	4	
Minor	3		Minor	3	
Elective	8		Elective	8	
	15			15	

130 Total Semester Hours

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[*] The organic chemistry will count toward the 24 hours of the chemistry major.

GEOLOGY

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

Sophomore Year

First Semester			*Second Semester*		
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Survey of Engl. and American Lit.	3	(3,0)
Geol 201 Physical Geology	3	(3,0)	Geol 204 Historical Geology	3	(3,0)
Geol 203 Phys. Geol. Lab.	1	(0,3)	Geol 205 Hist. Geol. Lab.	1	(0,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Modern Language	3	(3,0)
Modern Language	3	(3,1)	Approved Electives	6	
AS or MS or Elective	1		AS or MS or Elective	1	
	15			17	

Junior Year

Humanities	3		Geol 309 Petrology	3	(2,3)
Geol 306 Mineralogy	3	(2,3)	Humanities	3	
Major	3		Major	3	
Minor	3		Minor	3	
Approved Elective	3		Approved Elective	3	
	15			15	

Senior Year

Geol 402 Structural Geology	3	(2,2)	Geol 404 Economic Geology	3	(3,0)
Major	3		Major	3	
Minor	6		Minor	3	
Social Sciences	3		Social Sciences	3	
			Approved Elective	3	
	15			15	

128 Total Semester Hours

MATHEMATICS

For a major concentration a recommended program of study is shown below, with 127 semester hours required for graduation.

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Natural Science	4		Natural Science	4	
AS or MS or Elective*	1		AS or MS or Elective*	1	
	18			18	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Comp Sc 205 Computer Programming in PL/1	3	(2,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 295 Foundations of Analysis	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Elective	3		AS or MS or Elective*	1	
AS or MS or Elective*	1				
	17			14	

Junior Year

Math 313 Stat. Theory & Meth. I	3	(3,0)	Econ 201 Principles of Econ.	3	(3,0)
Math 411 Linear Algebra	3	(3,0)	Math 412 Introd. to Mod. Algebra	3	(3,0)
Humanities	3		Mus 310 Music Appreciation	3	(3,0)
Minor	3		or Arch 303 Evol. of Vis. Arts	3	(3,0)
Elective	3		Minor	3	
			Elective	3	
	15			15	

Senior Year

Math 463 Math. Anal. I	3	(3,0)	Math 464 Math. Anal. II	3	(3,0)
Math Elective	3		Math Elective	3	
Minor	6		Minor	6	
Social Sciences	3		Social Sciences	3	
	15			15	

127 Total Semester Hours

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* Those electing not to take ROTC should take a four-hour elective during the second semester sophomore year.

PHYSICS

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester		*Second Semester*	
Ch 101 General Chemistry	4 (3,3)	Ch 102 General Chemistry	4 (3,3)
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Math 106 Cal. of One Var.	4 (5,0)	Math 205 Cal. and Lin. Alg.	4 (5,0)
Modern Language	3 (3,1)	Modern Language	3 (3,1)
Phys 101 Current Phys	1 (0,2)	Phys 132 Gen. Phys. I	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	16		18

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Hist 203 History of Civilization	3 (3,0)	Hist 204 History of Civilization	3 (3,0)
Math 206 Cal. of Sev. Var.	4 (5,0)	Math 208 Engr. Math. I	4 (5,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
Phys 223 Electron Phys. Lab.	1 (0,3)	Phys 224 Modern Phys. Lab.	1 (0,3)
Phys 231 Gen. Phys. II	3 (3,0)	Phys 232 Gen. Phys. III	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	18		18

JUNIOR YEAR

Phys 321 Mechanics I	3 (3,0)	Phys 322 Mechanics II	3 (3,0)
Humanities	3	Phys 341 Elect. & Mag.	3 (3,0)
Minor	3	Humanities	3
Electives	5	Minor	3
		Elective	2
	14		14

SENIOR YEAR

Phys 455 Quantum Phys. I	3 (3,0)	Phys. Elective	4
Phys. Elective	4	Minor	3
Minor	6	Social Science	3
Social Science	3	Elective	4
	16		14

128 Total Semester Hours

For a minor concentration in Physics, 15 semester hours are required including Phys 221 and 222.

SECONDARY FIELDS OF CONCENTRATION

Biology. The recommended programs of study consists of 15 semester hours from the field of biological sciences in addition to Bot 101 and Zool 101, 103.

Economics. The recommended program of study consists of Econ 201, 202 and 15 semester hours selected from the following (including 314 and 407): Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 422, Ex St 462, IM 311, 404, 406, Ag Ec 456.

English. The recommended program of study includes the required courses of the Bachelor of Arts curriculum and 15 semester hours of English, arranged as follows:

Group I—Six semester credits from these courses: Engl 405 and either 423 or 424.

Group II—Three semester credits from these courses: Engl 402, 404, 425, 427, 431, 443, 461, 462.

Group III—Six additional semester credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The recommended program of study consists of Hum 201, 202 or Arch 101, 102 and 15 semester hours from the following courses: Arch 303, 315, 316, 415, 416, 511, 512; Engl 305, 311, 331, 332, 333; Hum 203; Mus 151, 152, 310, 315, 316, 362, 363, 364, 365, 405, 406, 411; Phil 305; Vis 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416. Departmental prerequisites for advanced courses must be met or permission of the instructor.

History. The recommended program of study consists of 15 semester hours with a minimum of three hours from each of the following groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—Hist 361, 363, 371, 386, 473, 476, 477, 479, 480, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342.

Modern Languages. Completion of 15 semester hours in one language from courses numbered higher than 300 is required to fulfill the requirements for the secondary field of concentration.

Philosophy. The recommended program of study consists of 15 semester hours of course work beyond Phil 201, 202—drawn from Phil 303, 304, 305, 312, 318, 322, 344, 422, 425, Rel 309.

Political Science. The recommended program of study consists of 15 semester hours beyond Pol Sc 101 (or 202 or 301) and 201 in courses drawn from at least three of the following fields:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433
4. Political Behavior—Pol Sc 341, 442, 433
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372, 373

Psychology. The recommended program of study consists of required courses Psych 201, 202 and 15 semester hours to be selected from Psych 302, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 498, Comp Sc 205.

Sociology. A minor consists of 15 semester hours beyond Soc 201, 202 to be selected from Pol Sc 341, Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499, RS 359.

CLUSTER MINORS

Group I—Social Sciences

No fewer than two courses in each subject chosen:

- History
- Political Science
- Psychology
- Sociology
- Economics

Group II—Philosophy and Religion

Group III—Fine Arts

Of these courses, 9 semester credits must be taken in courses numbered 300 or higher:

- Architecture 315, 316, 403, 415, 416, 511, 512;
- English 305, 311, 331, 332, 333;
- Music 151, 152, 310, 315, 316, 362, 363, 364, 365, 405, 406, 411;
- Philosophy 305;
- Visual Arts 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416.

Group IV—Administration

No fewer than two courses in each subject chosen:

- Economics
- Accounting
- Industrial Management

Group V—Life Sciences

No course in the 100 series is applicable and not more than two courses in the 200 series. No fewer than two courses in each subject chosen:

- Bacteriology
- Botany
- Genetics
- Zoology

Group VI—Physical Sciences

No course in the 100 series is applicable and not more than two courses in each subject chosen:

- Physics
- Chemistry
- Geology
- Mathematics

BACHELOR OF SCIENCE CURRICULUMS

CHEMISTRY

Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to the student whose education is built around the principles of this discipline.

The curriculum in chemistry provides, through its advanced chemistry courses and large number of elective hours, a program that may be suited to a student's specific needs, whether he be interested in graduate work; industrial chemistry, sales or supervision; or related professional fields. [Significant features of the program are the student's extensive participation in experimental laboratory work and his association with teachers who also pursue research activities. Because the undergraduate and graduate studies are closely connected, an undergraduate may elect to take part in a research investigation during his junior and senior years.]

CHEMISTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

SOPHOMORE YEAR

Ch 223 Org. Chem.	3	(3,0)	Ch 224 Org. Chem.	3	(3,0)
Ch 225 Org. Chem. Lab.	2	(0,6)	Ch 226 Org. Chem. Lab.	2	(0,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

First Semester			*Second Semester*		
Ch 313 Quan. Analysis	3	(3,0)	Ch 332 Phys. Chemistry	3	(3,0)
Ch 315 Quan. Anal. Lab.	2	(0,6)	Ch 334 Phys. Chemistry Lab.	2	(0,6)
Ch 331 Phys. Chemistry	3	(3,0)	Ch 442 Chem. Lit.	1	(1,0)
Ch 339 Phys. Chemistry Lab.	1	(0,3)	Ger 102 Elem. German	3	(3,1)
Ger 101 Elem. German	3	(3,1)	Elective[*]	9	
Elective[*]	5				
	17			18	

SENIOR YEAR

Ch 402 Inorg. Chem.	3	(3,0)	Ch 411 Instr. Analysis	4	(2,6)
Electives[*]	12		Electives[*]	12	
	15			16	

130 Total Semester Hours

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[*] Electives:
For the degree of B.S. in Chemistry, a student must elect at least 18 hours in English, Languages, History, Political Science, Economics, Sociology, Psychology, etc.

GEOLOGY

Geology is a relatively young science. The word itself is only about 200 years old. It means the science of the earth. Such a science must be involved with the physics and chemistry of materials which comprise the earth, but equally important it must consider the development of life on earth. Fundamentally, then, the chemical, physical, and biological responses to various environments on and in the earth must be thoroughly understood so that the historical development of the earth may be deduced, predictions of the future inferred, and natural resources intelligently developed.

Industry in our modern civilization is dependent on minerals and rocks. Metals have their origin in them as do our chief power sources, coal, petroleum, and radioactive minerals. The power and wealth of nations depend largely on their exploration, control and development of mineral wealth.

Geologists today are entering upon a new era. Widening horizons are indicated by employment not only in mineral producing industries but by railroads, municipalities, engineering firms, and water authorities. For this reason, it is important that the geologists' education rest on a broad yet rigorous base.

This curriculum provides the student with the fundamentals in the geological sciences and excellent support in the other basic sciences. On successful completion of the Bachelor of Science program the student should be adequately prepared for employment or for graduate study in any field of geology.

GEOLOGY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Modern Language*	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Geol 201 Physical Geology	3	(3,0)	Geol 204 Historical Geology	3	(3,0)
Geol 203 Phys. Geol. Lab.	1	(0,3)	Geol 205 Historical Geol. Lab.	1	(0,3)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			17	

JUNIOR YEAR

Geol 306 Mineralogy	3	(2,3)	Bot 101 General Botany	4	(3,3)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Ex St 301 Introd. Statistics	3	(2,2)
Phys 223 Electron Phys. Lab.	1	(0,3)	Geol 309 Petrology	3	(2,3)
Zool 101 Gen. Zoology	3	(3,0)	Geol 311 Strat. and Sed.	3	(3,0)
Zool 103 Gen. Zoology Lab.	1	(0,2)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Electives†	5		Phys 224 Modern Phys. Lab.	1	(0,3)
	16			17	

Summer Geology Field Camp,‡ 6 semester hours

SENIOR YEAR

Geol 402 Structural Geology	3	(2,2)	Geol 307 Optical Mineralogy	3	(2,2)
Geol 403 Invert. Paleontology	3	(2,3)	Geol 404 Economic Geology	3	(3,0)
Approved Electives†	9		Approved Electives†	9	
	15			15	

134 Total Semester Hours

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* German or French is recommended. Two years in the same language is required.

† At least 12 hours must be elected from the humanities and/or social sciences.

‡ Clemson University does not conduct a field camp in geology, but attendance at a camp approved by the geology staff is required.

MATHEMATICS

The mathematics curriculum is designed to give basic training to those students whose ultimate goal is the creation of mathematical concepts and methods that are of basic and general applicability to the desired subject whether it be physics, computer science, communication theory, data processing, statistics, operations research, economics, or any branch of the physical sciences in which a strong mathematical background is a prerequisite. In addition to containing basic mathematics courses which are needed to prepare the student for the present day mathematical world, the curriculum allows the student in his junior year, to select one of seven optional sets of courses which will provide an introduction to an area where mathematics is applied. These options are physics, operations research, computer science, managerial science, communications, chemistry, and statistics.

This curriculum provides an adequate background for the student who plans to pursue graduate study in mathematics and at the same time adequately prepares the student to fill many interesting positions in space research, computer development, business, or government research.

MATHEMATICS CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Fr 101 Elem. French	3	(3,1)	Fr 102 Elem. French	3	(3,1)
or Ger 101 Elem. German	3	(3,1)	or Ger 102 Elem. German	3	(3,1)
Hist 104 Western Civilization	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective[†]	1		AS or MS or Elective[†]	1	
	18			18	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Comp Sc 205 Comp. Prog. in PL/1	3	(2,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 295 Foundations of Anal.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Elective[*]	3		Elective[*]	3	
AS or MS or Elective[†]	1		AS or MS or Elective[†]	1	
	18			18	

JUNIOR YEAR

Econ 201 Principles of Econ.	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Math 313 Stat. Th. & Methods I	3	(3,0)	Math 411 Linear Algebra	3	(3,0)
Math 453 Adv. Calculus I	3	(3,0)	Math 454 Adv. Calculus II	3	(3,0)
or Math 463 Math. Anal. I[*]	3	(3,0)	or Math 464 Math. Anal. II[*]	3	(3,0)
Option	3		Option	3	
Elective[‡]	3		Elective[‡]	3	
	15			15	

SENIOR YEAR

Math 402 Th. of Probability	3	(3,0)	Math 403 Stat. Inference	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)	or Math 404 Introd. to Stoch. Proc.	3	(3,0)
Option	3		or Math 405 Stat. Th. & Methods II	3	(3,0)
Elective[‡]	4		Math Elective[*]	3	
	13		Option	3	
			Elective[‡]	4	
				13	

128 Total Semester Hours

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[*] Those who expect to go to graduate school should take a second year of the language of his choice; should take Math 463, 464 instead of Math 453, 454; should take Math 413 or 415 or 424 for this elective.

[‡] The electives may be taken from those courses which the catalog lists as approved courses in the College of Physical and Mathematical Sciences or the College of Liberal Arts or in other academic departments.

[†] Those electing not to take ROTC should take six hours of electives during each semester of the senior year.

The Options are:

A. CHEMISTRY

Ch 331 Physical Chemistry	3	(3,0)
Ch 332 Physical Chemistry	3	(3,0)
Ch 339 Physical Chem. Lab.	1	(0,3)
Ch 340 Physical Chem. Lab.	1	(0,3)
Ch 402 Inorganic Chemistry	3	(3,0)
Ch 431 Atomic & Molec. Structure	3	(3,0)
Ch 433 Physical Chem. Lab.	1	(0,3)
	15	

B. COMMUNICATIONS

EE 320 Electronics I	2	(2,0)
EE 321 Electronics II	2	(2,0)
EE 325 Elec. & Electromag. Lab.	1	(0,2)
EE 326 Elec. & Electromag. Lab.	1	(0,2)
EE 330 Systems I	2	(2,0)
EE 331 Elec. Circuits Workshop I	2	(0,4)
EE 332 Systems II	2	(2,0)
EE 333 Elec. Cir. Workshop II	2	(0,4)
	14	

C. COMPUTER SCIENCE

Comp Sc 311 Comp. Org. & Prog.	3	(3,0)
Comp Sc 409 Introd. to Num. Anal. I	3	(3,0)
Comp Sc 410 Introd. to Num. Anal. II	3	(3,0)
Comp Sc 428 Algo Lang. & Comp.	3	(3,0)
Math 452 Linear Programming	3	(3,0)
	15	

D. MANAGERIAL SCIENCE

Econ 202 Principles of Econ.	3	(3,0)
Econ 314 Inter. Econ. Th.	3	(3,0)
Mgt Sc 311 Introd. to Econometrics	3	(3,0)
or IM 404 Managerial Econ.	3	(3,0)
Math 452 Linear Programming	3	(3,0)
Math 473 Introd. to Nonlin. Opt.	3	(3,0)
	15	

E. OPERATIONS RESEARCH

IM 402 Oper. Plan. & Control	3	(3,0)
Math 404 Introd. to Stoch. Proc.	3	(3,0)
Math 429 Num. Anal. I	3	(3,0)
Math 452 Linear Programming	3	(3,0)
Math 473 Introd. to Nonlin. Opt.	3	(3,0)
	15	

F. PHYSICS

Phys 321 Mechanics I	3	(3,0)
Phys 322 Mechanics II	3	(3,0)
or Phys 404 Astrodynamics	3	(3,0)
or Phys 441 Elec. & Magnetism	3	(3,0)
Phys 341 Elec. & Magnetism	3	(3,0)
	9	

G. STATISTICS

Math 404 Introd. to Stoch Proc.	3	(3,0)
Math 405 Stat. Th. and Methods II	3	(3,0)
Math 409 Stat. Th. and Methods III	3	(3,0)
Math 471 Appl. Stat. Decision Theory	3	(3,0)
	12	

MEDICAL TECHNOLOGY

Medical Technologists are qualified to perform a wide variety of chemical, microscopical, and bacteriological tests to aid physicians in the detection, diagnosis, and treatment of disease. Some medical technologists are responsible to a medical doctor, generally a pathologist, while others work under the supervision of a medical scientist who specializes in a particular branch of clinical science. The largest group of medical technologists work in hospital laboratories.

In cooperation with the Anderson Memorial Hospital and the Greenville General Hospital, Clemson offers a four-year curriculum leading to the Bachelor of Science in Medical Technology. The student spends the first three years of this program in class work at Clemson and the fourth year at the Anderson or Greenville hospital, according to the student's choice and previous agreement with the hospital. While in residence in Anderson or Greenville, the student will take specified courses under instructors on the hospital staff. During the fourth year of work, both room and board are furnished by the hospital.

Upon satisfactory completion of the prescribed courses, the student will be awarded the Bachelor of Science degree in Medical Technology.

MEDICAL TECHNOLOGY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Bot 101 General Botany	4	(3,3)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Hist 101 American History	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 101 Mathematical Analysis	3	(3,0)	Math 102 Mathematical Analysis	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

SOPHOMORE YEAR

Ch 223 Organic Chemistry[*]	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 102 American History	3	(3,0)	Phys 201 General Physics	3	(3,0)
Zool 101 Gen. Zoology	3	(3,0)	Phys 203 Gen. Physics Lab.	1	(0,3)
Zool 103 Gen. Zoology Lab.	1	(0,2)	Electives	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	18			15	

JUNIOR YEAR

Ch 313 Quan. Analysis	3	(3,0)	Gen 302 Genetics	3	(2,3)
Ch 317 Quan. Anal. Lab.	1	(0,3)	Hist 204 History of Civilization	3	(3,0)
or Ch 310 Elem. Biochemistry	4	(3,3)	Micro 301 Gen. Microbiology	4	(3,3)
Hist 203 History of Civilization	3	(3,0)	Psych 201 Gen. Psychology	3	(3,0)
Phys 202 Gen. Physics	3	(3,0)	Electives	3	
Phys 204 Gen. Physics Lab.	1	(0,3)		16	
Zool 307 An. Anat. & Physio.	3	(2,3)			
Electives	2				
	16				

SENIOR YEAR
(52 Weeks)

Med Tech 401	Serology and Immunology	4	(21,10, 49)[*]
Med Tech 402	Microbiology	7	(56, 6,470)
Med Tech 403	Hematology	5	(12,32,276)
Med Tech 404	Blood Bank	3	(8,20,132)
Med Tech 405	Cytology	1	(2,12, 26)
Med Tech 406	Histology	3	(20,30,190)
Med Tech 407	Urinalysis	2	(10, 8,102)
Med Tech 408	Chemistry	10	(40,50,470)
Med Tech 409	Radioisotopes	1	(2, 0, 7)
		36	

136 Total Semester Hours

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[*] First figure represents lecture hours, second figure represents seminar hours, and third figure represents clinical practice hours.

PHYSICS

Physics is the fundamental science. The word physics comes from the Greek term meaning nature. Therefore, physics is a science dedicated to the study of all natural phenomena. Physics is the foundation for the other experimental sciences. The physics curriculum is designed with this point of view.

The first two years of the physics curriculum is generally the same as that for mathematics, the other physical sciences and engineering. During the junior and senior years the physics student is given a strong background in the basic physics courses at an advanced level and is allowed to specialize in a variety of other fields by selecting one of eight options. The options are astrophysics, biophysics, chemical physics, computer science, electronics, geophysics, mathematical physics, and physics. After completing one of these curriculums the student is prepared for positions in industry (*e. g.*, aircraft, electronics, petroleum, textiles, pharmaceutical) and government laboratories (*e. g.*, space research). Those students who select the physics or mathematical physics options are well equipped for graduate study in physics.

PHYSICS CURRICULUM WITH OPTIONS IN THE PHYSICAL AND MATHEMATICAL SCIENCES

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Fr 101 Elem. French	3	(3,1)	Fr 102 Elem. French	3	(3,1)
or Ger 101 Elem. German[*]	3	(3,1)	or Ger 102 Elem. German[*]	3	(3,1)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. & Lin. Alg.	4	(5,0)
Phys 101 Current Phys.	1	(0,2)	Phys 132 Gen. Physics	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I[‡]	4	(5,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 231 Gen. Physics II	3	(3,0)	Phys 232 Gen. Physics III	3	(3,0)
Approved Elective[†]	4		Approved Elective[†]	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Hist 204 History of Civilization	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Math 309 Engr. Math II[‡]	3	(3,0)	Phys 326 Exp. Physics II	4	(2,6)
Phys 321 Mechanics I	3	(3,0)	Phys 341 Elect. & Magnetism	3	(3,0)
Phys 325 Exp. Physics I	4	(2,6)	Approved Elective[†]	3	
Option[§]	3		Option[§]	3	
	16			16	

SENIOR YEAR

Phys 441 Elect. & Magnetism	3	(3,0)	Physics (as approved)	3	(3,0)
Phys 455 Quantum Physics I	3	(3,0)	Option[§]	3	
Phys 465 Thermo. & Stat. Mech.	3	(3,0)	Approved Elective[†]	9	
Approved Elective[†]	3			15	
Option[§]	3				
	15				

128 Total Semester Hours

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[*] Russ 101, 102 may be substituted.

[†] A minimum of 12 hours of electives must be chosen from course offerings in the Humanities and Social Sciences.

[‡] Math 306 and 411 may be taken in lieu of Math 208 and 309.

[§] The OPTIONS are:

A. ASTROPHYSICS			B. CHEMICAL PHYSICS		
Phys 304 Descriptive Astronomy	3	(3,0)	Ch 331 Physical Chem.	3	(3,0)
Phys 404 Astrodynamics	3	(3,0)	Ch 332 Physical Chem.	3	(3,0)
Phys 432 Physical Optics	3	(3,0)	Ch 431 Atomic & Molec. Struct.	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)	Phys 456 Quantum Physics II	3	(3,0)
	12		or Ch 402 Inorganic Chem.	3	(3,0)
				12	

C. COMPUTER SCIENCE

Comp Sc 205 Comp. Prog.	3	(2,3)
Comp Sc 311 Com. Organ. & Pro.	3	(3,0)
Comp Sc 409 Numerical Anal.	3	(3,0)
Comp Sc 428 Algorith. Lang. & Compilers	3	(3,0)
or Phys 446 Solid St. Phys.	3	(3,0)
or Math 429 Introd. Num. Anal.	3	(3,0)
	12	

D. ELECTRONICS

EE 330 Systems I	2	(2,0)
EE 331 Elec. Workshop I	2	(0,4)
EE 332 Systems II	2	(2,0)
EE 333 Elec. Workshop II	2	(0,4)
EE 320 Electronics I	2	(2,0)
EE 325 Electronics Lab. I	1	(0,2)
	11	

E. GEOPHYSICS

Geol 201 Physical Geo.	3	(3,0)
Geol 203 Physical Geo. Lab.	1	(0,3)
Geol 306 Mineralogy	3	(2,3)
Any two of Geol 309	3	(2,3)
Geol 402	3	(2,2)
Phys 446	3	(3,0)
	13	

F. MATHEMATICAL PHYSICS

Math 453 Advanced Cal. I	3	(3,0)
Math 454 Advanced Cal. II	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
Math (as approved)	3	(3,0)
	12	

G. PHYSICS

Phys 446	Solid St. Phys.	3	(3,0)
Phys 456	Quantum Physics II	3	(3,0)
Math	(as approved)	6	
		12	

PHYSICS CURRICULUM WITH BIOPHYSICS OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Fr 101 Elem. French	3	(3,1)	Fr 102 Elem. French	3	(3,1)
or Ger 101 Elem. German	3	(3,1)	or Ger 102 Elem. German[*]	3	(3,1)
Math 106 Cal. of One Var.	4	(5,0)	Math 205 Cal. & Lin. Alg.	4	(5,0)
Phys 101 Current Phys.	1	(0,2)	Phys 132 Gen. Physics I	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Bot 101 General Botany	4	(3,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 223 Gen. Physics Lab.	1	(0,3)	Math 208 Engr. Math. I	4	(5,0)
Phys 231 Gen. Physics II	3	(3,0)	Phys 224 Gen. Physics Lab.	1	(0,3)
Zool 101 Gen. Zoology	3	(3,0)	Phys 232 Gen. Physics III	3	(3,0)
Zool 103 Gen. Zoology Lab.	1	(0,2)	AS or MS or Elective	1	
AS or MS or Elective	1			16	
	16				

JUNIOR YEAR

Hist 204 History of Civilization	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Phys 321 Mechanics I	3	(3,0)	Phys 326 Exp. Physics II	4	(2,6)
Phys 325 Exp. Physics I	4	(2,6)	Phys 341 Elect. & Magnetism	3	(3,0)
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Approved Elective[†]	2		Approved Elective[†]	2	
	16			16	

SENIOR YEAR

Phys 455 Quantum Physics I	3	(3,0)	Physics (as approved)	3	(3,0)
Phys 465 Thermo. & Stat. Mech.	3	(3,0)	Ch 424 BioChem.	3	(3,0)
Ch 423 BioChem.	3	(3,0)	Ch 426 BioChem. Lab.	1	(1,0)
Ch 425 BioChem. Lab.	1	(0,3)	Approved Elective[†]	8	
Approved Elective[†]	5			15	
	15				

128 Total Semester Hours

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[*] Russ 101, 102 may be substituted.

[†] A minimum of 12 hours of electives must be chosen from course offerings in the Humanities and Social Sciences.

PRE-MEDICINE AND PRE-DENTISTRY

Medicine and dentistry need individuals with a diversity of educational backgrounds and a wide variety of talents and interests. The philosophies of education, specific premedical and predental courses requirements, other qualifications for enrollment, and systems of training vary among the medical and dental schools, but all recognize the desirability of a broad education—a good foundation in the natural sciences (mathematics, chemistry, biology, and physics), highly developed communication skills, and a solid background in the social sciences and humanities. The absolute requirements for medical and dental school admission (16 credit hours in chemistry, 8 credit hours in biology, 8 credit hours in physics, 6 credit hours in English, and 6 credit hours in mathematics) are purposely limited in order to allow latitude for developing individualized undergraduate programs of study.

The student preparing for a career in medicine or dentistry can major in the behavioral or natural sciences, and many do major in one of the sciences; however, this is not necessary. The Association of American Medical Colleges and the American Association of Dental Schools recommend that the premedical and predental student should feel free to develop his major area of interest, realizing that the medical and dental school is more interested in the quality and scope of the work accomplished than in the time spent or the major field chosen. It is possible to major in a nonscience area, carrying the necessary science courses as electives; however, since so much of medicine and dentistry is derived from a scientific basis, the student who majors in a nonscientific field and elects the minimum number of required science courses must excel in them to insure the adequacy of his preparation.

A suggested curriculum in Pre-medicine and Pre-dentistry, offered here, is designed to meet the general entrance requirements of most medical and dental schools and, as well, to provide a broad education in the natural sciences, the social sciences, the humanities, and communication skills.

Those preparing for the study of medicine are advised to complete four years of undergraduate work before entering a medical school, although some medical schools will admit an exceptional student after three years of preparation. Many dental schools will accept the better student after three years of preparation.

PRE-MEDICINE AND PRE-DENTISTRY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Bot 101 General Botany	4	(3,3)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Math 106 Cal. of One Var.	4	(5,0)	Engl 102 English Composition	3	(3,0)
Zool 101 Gen. Zoology	3	(3,0)	Math 205 Cal. and Lin. Alg.	4	(5,0)
Zool 103 Gen. Zoology Lab.	1	(0,2)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			16	

Sophomore Year

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hum 201 Introd. to Humanities	3	(3,0)	Hum 202 Introd. to Humanities	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(3,0)	Phys 221 Therm. & Elec. Phen.	3	(3,0)
Soc 201 Introd. to Sociology	3	(3,0)	Phys 223 Electron Phys. Lab.	1	(0,3)
AS or MS or Elective	1		Soc 202 Social Problems	3	(3,0)
			AS or MS or Elective	1	
	17			18	

Junior Year

Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Gen 302 Genetics	3	(2,3)	Engl 217 Vocabulary Bldg.	3	(3,0)
Hist 203 History of Civilization	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Zool 301 Comp. Vert. Anat.	3	(2,3)	Zool 302 Vert. Embryology	3	(2,3)
Electives	4		Electives	4	
	16			16	

Senior Year

Engl 301 Public Speaking	3	(3,0)	Soc 381 Society & Socialization	3	(3,0)
Psych 201 Gen. Psychology	3	(3,0)	Electives	12	
Electives	10				
	16			15	

130 Total Semester Hours

PRE-PHARMACY

Pharmacy is a five-year program, the first two years of which can be taken at Clemson. The student who does pre-pharmacy here will transfer, as a rule, to the School of Pharmacy of the Medical University of South Carolina, where the final three years will be completed and by which institution the degree in Pharmacy will be awarded.

PRE-PHARMACY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Bot 101 General Botany	4	(3,3)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Hist 203 History of Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 101 Math Analysis I	3	(3,0)	Hist 204 History of Civilization	3	(3,0)
Zool 101 Gen. Zoology	3	(3,0)	Math 102 Math Analysis II	3	(3,0)
Zool 103 Gen. Zoology Lab.	1	(0,2)	AS or MS or Elective	1	
AS or MS or Elective	1				
	18			18	

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 201 General Physics	3	(3,0)	Phys 202 Gen. Physics	3	(3,0)
Phys 203 Gen. Physics Lab.	1	(0,3)	Phys 204 Gen. Physics Lab.	1	(0,3)
Soc 201 Introd. to Sociology	3	(3,0)	Soc 202 Social Problems	3	(3,0)
AS or MS or Elective	1		Electives	3	
			AS or MS or Elective	1	
	15			18	

69 Total Semester Hours

ACCEPTABLE ELECTIVES FOR STUDENTS IN THE COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

Class advisers in the College of Physical and Mathematical Sciences will normally approve the following courses as electives, but the Dean of Physical and Mathematical Sciences retains the prerogative of limiting the total number of credits that may be approved in a discipline or area:

All courses offered in the College of Liberal Arts and the College of Physical and Mathematical Sciences except Ch 450, Engl 111, 351, Geol 406, Math 102, 103, 104, 115, 116, 215, 216, Psych 101, 211, and Soc 101.

Certain upper level courses, not given in the College of Physical and Mathematical Sciences listed below, plus others recommended in a particular curriculum:

Acct 201, 202; Ag Ec 352, 357, 456; Arch 303, 315, 316, 415, 416, 511, 512; Bot 101, 352, 356, 404, 451; Econ 201, 202, 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 422; Ed 301, 302, 335, 405, 406; EE 315, 320, 321, 325, 326, 330, 331, 332, 333; Ent 301, 405, 408, 455; Ex St 462; Gen 302; IM 305, 307, 312, 313, 322, 404, 415; ME 481, 484, 486; Mgt Sc 311; Micro 301, 401; Mus 310, 315, 316, 361, 362, 363, 364, 405, 406, 411; Vis 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416; Zool 101, 103, 301, 302, 307, 403, 404, 405.

DESCRIPTION OF COURSES

This list of courses includes for each course the catalog number, title of course, credit in semester hours, class laboratory hours per week, and the description of the course. In general, courses numbered 100-199 are freshman courses; 200-299, sophomore courses; 300-399, junior courses; and 400-499, senior courses. Courses numbered 600 or above are graduate courses and are open only to students admitted to the Graduate School, except that seniors with exceptional records may be enrolled with special permission. Where courses are offered on a schedule, there is a designation F, S, or SS following the title of each course, indicating whether it is customarily offered in the fall, spring, or summer school.

ACCOUNTING

Professor: C. C. DAVIS

Associate Professors: F. R. GRAY, J. M. WANNAMAKER

Assistant Professor: J. A. TURNER

Instructor: J. E. FRIESE

ACCT 201—PRINCIPLES OF ACCOUNTING—3 cr. (3 and 0)

Practice in handling real and nominal accounts, together with an introduction to the use of various types of books of original entry, statements of profit and loss, and balance sheets.

ACCT 202—PRINCIPLES OF ACCOUNTING—3 cr. (3 and 0)

Continuation of Acct 201 with special attention to corporation and partnership accounting with emphasis on adjustment procedures and the analysis of financial statements. *Prerequisite:* Acct 201.

ACCT 301—INTERMEDIATE ACCOUNTING—3 cr. (3 and 0)

A course in the theory of accountancy designed to follow introductory theory presented in the basic principles courses. Intermediate accounting seeks to broaden the student's knowledge of financial accounting theory and practice. *Prerequisite:* Acct 201 and 202.

ACCT 302—INTERMEDIATE ACCOUNTING—3 cr. (3 and 0)

A continuation of Accounting 301 with emphasis on managerial accounting. *Prerequisite:* Acct 201 and 202.

ACCT 303—COST ACCOUNTING—3 cr. (3 and 0)

The application of cost analysis to manufacturing and distributing problems. Analysis of the behavior characteristics of business costs and a study of principles involved in standard cost systems. Lectures and problems. *Prerequisite:* Acct 201 and 202.

ACCT 305—INCOME TAXATION—3 cr. (3 and 0)

Interpretation of Federal Income Tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Prerequisite:* Junior standing.

Acct 403—Accounting Research—2 cr. (2 and 0)

A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

Acct 405—Advanced Federal Taxes—3 cr. (3 and 0)

Tax planning and research. Advanced phases of income taxation with emphasis on special problems applicable to corporations, partnerships, estates and trusts. *Prerequisite:* Acct 305.

Acct 407—Accounting Research—1 cr. (1 and 0)

A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

Acct 410—Budgeting and Executive Control—3 cr. (3 and 0)

The study and application of selected techniques used in the planning and control functions of business organizations. *Prerequisite:* Acct 303.

Acct 411—Advanced Accounting—3 cr. (3 and 0)

A study of accounting principles and practices emphasizing parent-subsidiary accounting. *Prerequisite:* Acct 301, 302.

Acct 415—Auditing—3 cr. (3 and 0)

Professional and practical auditing theory. Review of internal controls, audit procedures, and development of audit programs for various types of businesses; consideration of auditor's professional and ethical standards. *Prerequisite:* Acct 301, 302.

Acct 420—CPA Review—3 cr. (3 and 0)

Intensive practice in analyzing and solving CPA level accounting problems. *Prerequisite:* Acct 411.

Acct 705—Advanced Federal Taxes—3 cr. (3 and 0)

Acct 710—Budgeting and Executive Control—3 cr. (3 and 0)

Acct 711—Advanced Accounting—3 cr. (3 and 0)

Acct 715—Auditing—3 cr. (3 and 0)

AEROSPACE STUDIES

Professor: Colonel E. N. Tyndall, *Head*

Assistant Professors: Maj. M. R. Koldyke, Jr., Maj. B. K. Murray, Maj. C. D. Parker, Capt. J. M. Etheredge, Capt. J. W. Giles, Capt. R. M. Peavler, Capt. W. L. Wilson

GENERAL MILITARY EDUCATION PROGRAM

AS 109—World Military Systems—1 cr. (1 and 1)

An introduction to factors of natural power, principles and nature of war; legislation, organization and function of the Department of Defense; history, missions, and organization of the United States Air Force. Corps Training includes drill fundamentals, customs and courtesies of the service.

AS 110—World Military Systems—1 cr. (1 and 1)

Surveys the history and development of U. S. strategic offensive and defensive forces including their missions, functions and organization; conventional nuclear weaponry, civil defense, aircraft and missile defense, concepts of

present and projections of future strategic defense requirements. Corps Training includes drill and ceremonies and Air Force career opportunities.

AS 209—WORLD MILITARY SYSTEMS—1 cr. (1 and 1)
A continuation of the study of world military forces placing special emphasis on the General Purposes forces of the Air Force, Army and Navy and their role throughout the entire spectrum of warfare. Also included are the roles of the aerospace support forces which enable the combat forces to carry out their primary missions. Corps Training.

AS 210—WORLD MILITARY SYSTEMS—1 cr. (1 and 1)
A study of the trends and implications in international affairs highlighting the struggle, the search and the prospects for peace. Special emphasis is given the conflict between democracy and communism, the alliances and collective security agreements of the United States to preserve peace and some of the specific problems and solutions involved in the search for peace. Corps Training.

PROFESSIONAL OFFICER EDUCATION PROGRAM

AS 309—GROWTH AND DEVELOPMENT OF AEROSPACE POWER—3 cr. (3 and 1)
A comprehensive study of the development of Aerospace Power and the USAF, its doctrine, mission and organization. Course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training emphasizes leadership development and Air Force career opportunities.

AS 310—GROWTH AND DEVELOPMENT OF AEROSPACE POWER—3 cr. (3 and 1)
A study of current and planned space programs. Reviews the characteristics of the solar system and operating principles associated with the major components of space exploration systems. As in AS 309, course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training includes drill and ceremonies and the environment of the Air Force officer.

AS 409—THE PROFESSIONAL OFFICER—3 cr. (3 and 1)
A study of military professionalism, leadership, and discipline. Covers leadership theory and practice. Compares leadership in the military with private enterprise. Flight instruction and ground school for pilot candidates. Corps Training provides cadets experience in the guidance, direction, and control of an Air Force unit.

AS 410—THE PROFESSIONAL OFFICER—3 cr. (3 and 1)
A continuation of the study of professionalism with the stress on management principles and functions. An introduction to systems and approaches to decision making and resource control used in the Air Force. Includes participation in problem-situation exercises. The course concludes with instruction to prepare cadets for active duty in the Air Force. Corps Training emphasizes advanced leadership functions.

AGRICULTURAL ECONOMICS

Professors: W. J. LANHAM, *Head;* J. M. STEPP

Associate Professors: L. M. BAUKNIGHT, JR., J. W. HUBBARD, H. C. SPURLOCK, G. R. VON TUNGELN

Assistant Professors: A. B. CARROLL, R. K. DEHAVEN, B. L. DILLMAN, J. C. HITE, J. S. LYTLE

AG EC 202—AGRICULTURAL ECONOMICS—3 cr. (3 and 0) F, S

An analytical survey of the various subdivisions of agricultural economics, to include farm organization, enterprise analysis, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy. *Prerequisite:* Econ 201.

AG EC 302—AGRICULTURAL FIRM MANAGEMENT—3 cr. (2 and 3) F, S

Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is directed to management aspects of the farm as a production unit. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 305—AGRICULTURAL BUSINESS ANALYSIS—3 cr. (2 and 3) F, S

The principles of financial statement analysis applied to management of farms and other agricultural business firms. Emphasis is placed on enterprise analysis, profitability determination, and other aspects of internal financial operations. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 309—ECONOMICS OF AGRICULTURAL MARKETING—3 cr. (3 and 0) F, S

A general course in marketing agricultural commodities, with particular emphasis upon food products. Efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions are analyzed. *Prerequisite:* Econ 201.

AG EC 351—ADVERTISING AND MERCHANDISING—3 cr. (3 and 0) F, S

A general introduction to advertising and merchandising theories and some practice with basic techniques. A partial list of subjects covered includes: function of advertising, propriety in advertising, institutions, media, market research, consumer appeals, loss leaders, mass displays, trademarks and brands, writing copy, color, layout, agencies and integrated advertising campaigns. *Prerequisite:* Junior standing.

AG EC 352—PUBLIC FINANCE—3 cr. (3 and 0) F, S, SS

Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy.

AG EC 357—NATURAL RESOURCE ECONOMICS—3 cr. (3 and 0) F, S, SS

The principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. *Prerequisite:* Econ 201.

AG EC 402—ECONOMICS OF AGRICULTURAL PRODUCTION—3 cr. (3 and 0) F

An economic analysis of agricultural production involving (a) the concept of the farm as a firm, (b) principles for decision making, (c) the quantitative nature and use of production and cost functions and their interrelations and

application of these principles to resource allocation on farms and among areas. *Prerequisite:* Permission of instructor.

AG EC 403—LAND ECONOMICS—3 cr. (3 and 0)
A study of the characteristics of land and of the physical, legal, social and economic principles and problems relating to the control and use of land resources. *Prerequisite:* Permission of instructor.

AG EC 405—SEMINAR—1 cr. (1 and 0) F
An examination of the relation of economics and sociology to specific problems. *Prerequisite:* Major in Agricultural Economics.

AG EC 406—SEMINAR—1 cr. (1 and 0) S
A continuation of Ag Ec 405.

AG EC 451—AGRICULTURAL COOPERATION—2 cr. (2 and 0) F
The principles and practices of business organization and management governing the successful operation of cooperative business enterprises. Major emphasis is placed upon cooperative selling, processing, purchasing, and service enterprises that serve farm people. *Prerequisite:* Econ 201.

AG EC 452—AGRICULTURAL POLICY—3 cr. (3 and 0) F, S
A review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Included are economic considerations as related to past and current farm price and income problems. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 456—PRICES—3 cr. (3 and 0) F, S
A review of the basic theory of price under competitive conditions and various modifications; nature, measurement and causes of daily, seasonal and cyclical price fluctuations; geographical price relationships; nature, function and behavior of futures markets; government price programs. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 460—AGRICULTURAL FINANCE—2 cr. (2 and 0) F, S
The financial needs of agriculture and of the organization, functions and interrelationships of agencies developed to meet these needs. *Prerequisite:* Econ 201.

AG EC 702—ECONOMICS OF AGRICULTURAL PRODUCTION—3 cr. (3 and 0)

AG EC 703—LAND ECONOMICS—3 cr. (3 and 0)

AG EC 751—AGRICULTURAL COOPERATION—2 cr. (2 and 0)

AG EC 752—AGRICULTURAL POLICY—3 cr. (3 and 0)

AG EC 756—PRICES—3 cr. (3 and 0)

AG EC 760—AGRICULTURAL FINANCE—2 cr. (2 and 0)

AG EC 802—AGRICULTURAL PRODUCTION ECONOMICS PROBLEMS—3 cr. (3 and 0)

AG EC 804—WATER RESOURCE POLICIES—3 cr. (3 and 0)

AG EC 806—ECONOMIC DEVELOPMENT IN AGRICULTURAL AREAS—3 cr. (3 and 0)

Ag Ec 807—Market Structure in Agricultural Industries—3 cr. (3 and 0)

Ag Ec 808—Applied Quantifications in Agricultural Economics—3 cr. (3 and 0)

Ag Ec 814—Contemporary Economic Problems—3 cr. (3 and 0)

Ag Ec 851—Seminar in Research Methodology—1 cr. (1 and 0)

Ag Ec 891—Thesis Research—Credit to be arranged.

Ag Ec 904—Seminar in Resource Economics—3 cr. (3 and 0)

Ag Ec 906—Seminar in Area Economic Development—3 cr. (3 and 0)

Ag Ec 907—Agricultural Marketing Problems—3 cr. (3 and 0)

Ag Ec 991—Doctoral Research—Credit to be arranged.

AGRICULTURAL EDUCATION*

Professor: L. H. Davis, *Head*

Associate Professors: W. C. Bowen, E. T. Carpenter, F. E. Kirkley

Assistant Professor: J. A. Hash

Ag Ed 201—Introduction to Agricultural Education—3 cr. (2 and 2)
Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of farm people.

Ag Ed 401—Methods in Agricultural Education—3 cr. (2 and 2)
Appropriate methods of teaching vocational agriculture in high schools. The course includes procedures for organizing teaching programs, teaching high school students, and directing F. F. A. activities.

Ag Ed 406—Directed Teaching—6 cr. (0 and 18)
Guided participation in the professional responsibilities of a teacher of vocational agriculture including an intensive study of the problems encountered and the competencies developed. A half semester of directed teaching in selected schools is required. *Prerequisite:* Ag Ed 401 and Ag Ed 422.

Ag Ed 422—Introduction to Adult Education—3 cr. (2 and 2)
History and nature of adult education in the United States, with emphasis on adult education for rural people.

Ag Ed 431—Methods in Conservation Education—3 cr. (3 and 0)
A study of various techniques appropriate to teaching conservation. Instruction is applicable to both elementary and high school teachers. (Offered in Summer School only.)

Ag Ed 463—Advanced Conservation Education—3 cr. (3 and 0)
The broader aspects of conservation education. The course includes historical, geographical, and national conservation problems. (Offered in Summer School only.)

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* Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

AG ED 465—PROGRAM DEVELOPMENT IN AGRICULTURAL EDUCATION—3 cr. (3 and 0)
Each student will determine needs and resources in a specific community and plan a program to meet these needs.

AG ED 467—ADULT EDUCATION IN AGRICULTURE—3 cr. (2 and 3)
Principles and practices appropriate to the solution of problems encountered in instructional programs for adult farmers.

AG ED 701—METHODS IN AGRICULTURAL EDUCATION—3 cr. (2 and 3)

AG ED 763—ADVANCED CONSERVATION EDUCATION—3 cr. (3 and 0)

AG ED 765—PROGRAM DEVELOPMENT IN AGRICULTURAL EDUCATION—3 cr. (3 and 0)

AG ED 767—ADULT EDUCATION IN AGRICULTURE—3 cr. (2 and 3)

AG ED 803—EVALUATION IN AGRICULTURAL EDUCATION—3 cr. (2 and 3)

AG ED 804—SPECIAL PROBLEMS—3 cr. (2 and 3)

AG ED 805—ADMINISTRATION AND SUPERVISION IN AGRICULTURAL EDUCATION—3 cr. (3 and 0)

AG ED 815—ADVANCED METHODS OF TEACHING FARM MECHANICS—3 cr. (2 and 3)

AG ED 820—TEACHING YOUNG FARMERS—3 cr. (3 and 0)

AG ED 825—SUPERVISION OF STUDENT TEACHING—3 cr. (3 and 0)

AG ED 869—SEMINAR—1-3 cr. (1-3 and 0)

AG ED 891—INTRODUCTION TO RESEARCH IN EDUCATION—3 cr.

AGRICULTURAL ENGINEERING*

Professors: A. W. SNELL, *Head;* T. V. WILSON

Associate Professors: T. H. GARNER, C. E. HOOD, JR., J. R. LAMBERT, J. T. LIGON, E. B. ROGERS, JR., B. K. WEBB

Assistant Professor: J. T. CRAIG

AGE 205—FARM SHOP—3 cr. (2 and 3) S
Correct methods and underlying reasons in proper use and maintenance of hand and power tools are emphasized. Principal topics include: carpentry, painting and finishing, soldering and sheet metal work, farm concrete, pipe fitting and plumbing, and farm and home water supply systems.

AGE 206—AGRICULTURAL MECHANIZATION—3 cr. (2 and 3) F, S
The agricultural student is taught to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Planning efficient operational systems and wise selection of equipment, based on function and economic suitability, are stressed. *Prerequisite:* Math 103, 104, Phys 201 and 203.

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* Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

AgE 212—Fundamentals of Mechanization—3 cr. (2 and 3) S
Functional analysis of selected agricultural equipment and the economic performance of machine systems; also, the utility and principles of applied technology and processes essential to providing a background for engineering design, research and development. *Prerequisite:* EG 109.

AgE 221—Soil and Water Resources Engineering I—3 cr. (2 and 3) F
Physical relationships of factors governing rainfall disposition are used as bases for defining the hydrology of agricultural watersheds. The surveying necessary for design and application of resource management measures and structures is taught. *Prerequisite:* Math 106.

AgE 301—Soil and Water Conservation—3 cr. (2 and 3) F
Engineering and agronomic principles are applied to water management in agriculture. Elementary surveying, mathematics, crops and soil fundamentals are embodied into principles and practices of erosion control, drainage, water conservation and irrigation. *Prerequisite:* Math 103, 104.

AgE 352—Farm Power—3 cr. (2 and 3) F and SS, '71 and alternate years.
Farm tractors and stationary power units. Principles of operation, preventive maintenance, adjustment and general repair are emphasized. *Prerequisite:* AgE 206.

AgE 353—Computational Systems—2 cr. (0 and 6) F
The fundamentals of computational systems including symbolic logic will be followed by methods and techniques of programming digital and analog computers to give solutions to agricultural engineering problems. *Prerequisite:* Math 208.

AgE 355—Engineering Analysis and Creativity—2 cr. (1 and 3) F
The creative and analytical portions of the engineering design process are developed in a problem approach. Application of physical and mathematical principles, analytical and experimental modeling and intelligent assumption making are stressed. Students are also introduced to the techniques of systems analysis. *Prerequisite:* Math 208 and Phys 221.

AgE 360—Farm and Home Utilities—3 cr. (2 and 3)
S and SS, '70 and alternate years.
A course for seniors and graduate students in agriculture curriculums, involving a study of electric and other utilities on the farm and in the home. Selection installation and maintenance of wiring systems, motors and controls, home water systems and sewage disposal systems are emphasized. *Prerequisite:* Junior standing.

AgE 362—Energy Conversion in Agricultural Systems—3 cr. (2 and 3)
S, '71 and alternate years.
The energy requirements of agricultural systems with emphasis upon energy conversion methods. Characteristics of various sources of energy will be considered including economic aspects. The present energy conversion mechanisms used in agriculture will be studied and their limitations considered. *Prerequisite:* EM 202, ME 311.

AgE 416—Agricultural Machinery Design—3 cr. (2 and 3) S
Engineering analysis of machines and basic agricultural operations and systems requiring machine functions. Fundamentals of machine design with

applications to agricultural machinery. Velocity and acceleration, analyses, dimension determination, power transmission, and vibrations in machinery are studied. *Prerequisite:* EM 304.

AGE 422—SOIL AND WATER RESOURCES ENGINEERING II—3 cr. (2 and 3) S
Basic soil-water-plant relationships are used to establish criteria for the analysis and design of facilities and structures for conservation, water control, drainage and irrigation. Engineering relationships involved in the design of such facilities are emphasized. *Prerequisite:* Math 208 and EM 320.

AGE 431—AGRICULTURAL STRUCTURES DESIGN—3 cr. (2 and 3)
F, '71 and alternate years.
Analytic and synthetic design of building components, including fastening devices, as determined by both live and dead loads with emphasis on statically determinant members and their positions and utilization in frames and trusses. Major materials considered are wood, steel and concrete. *Corequisite:* EM 304.

AGE 442—AGRICULTURAL PROCESS ENGINEERING—3 cr. (2 and 3)
S, 72 and alternate years.
Design of unit operations components used in agricultural processing. Engineering principles and instrumentation as applied to control systems, heat transfer, materials handling, storage and related subjects are emphasized. *Prerequisite:* ME 311 and EE 308.

AGE 465—ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS—3 cr. (2 and 3) S, '71 and alternate years.
The thermal, electrical, mechanical, and chemical characteristics of biological materials, organisms, and metabolic processes are studied in relationship to engineering analysis and synthesis. The effects of environmental factors imposed by engineering processes are evaluated. *Prerequisite:* Math 208, EM 304, Bot 101, Zool 101, 103.

AGE 471—UNDERGRADUATE RESEARCH—1 cr. (0 and 3) F
A course to acquaint senior students in Agricultural Engineering with the scientific method. Literature investigations, planning and executing of an experiment are integral parts of the course. *Prerequisite:* Senior standing in Agricultural Engineering.

AGE 473—SPECIAL TOPICS IN AGRICULTURAL ENGINEERING—3 cr. (3 and 0)
A comprehensive study of special topics in the field of agricultural engineering not covered in other courses. Special emphasis will be placed on independent pursuit of detailed investigations.

AGE H473—SPECIAL TOPICS IN AGRICULTURAL ENGINEERING—3 cr. (3 and 0)
Honors section of AgE 473; admission by invitation.

AGE 481—FUNDAMENTALS OF GINNING ENGINEERING—3 cr. (2 and 3)
S, '71 and alternate years.
An analysis of the engineering requirements and associated problems in all phases of ginning, such as handling, storage, drying, separating lint, cleaning, pressing, disposing of foreign matter, quarantine treatment, power requirements and safety precautions. *Prerequisite:* EM 304 or equivalent.

AGE 652—FARM POWER—3 cr. (2 and 3)

AGE 660—FARM AND HOME UTILITIES—3 cr. (2 and 3)

AgE 716—Agricultural Machinery Design—3 cr. (2 and 3)

AgE 722—Soil and Water Resources Engineering II—3 cr. (2 and 3)

AgE 731—Agricultural Structural Design—3 cr. (2 and 3)

AgE 742—Agricultural Process Engineering—3 cr. (2 and 3)

AgE 765—Engineering Properties of Biological Materials—3 cr. (2 and 3)

AgE 801—Special Problems in Agricultural Engineering—3 cr. (3 and 0)

AgE 804—Engineering Application to Agricultural Processing—3 cr. (2 and 3)

AgE 806—Instrumentation in Agricultural and Biological Research—3 cr. (2 and 3)

AgE 811—Tillage and Soil Dynamics—3 cr. (3 and 0)

AgE 822—Water Movement in Soils—3 cr. (3 and 0)

AgE 873—Radiological Health—3 cr. (2 and 3)

AgE 874—Radiological Health Engineering—3 cr. (2 and 3)

AgE 882—Systems Engineering—3 cr. (2 and 3)

AgE 891—Research—Credit to be arranged.

AgE 901—Special Problems in Agricultural Engineering—3 cr. (3 and 0)

AgE 991—Doctoral Research—Credit to be arranged.

AGRICULTURE

Professors: J. W. Jones, J. T. Lazar, Jr., R. R. Ritchie

Associate Professors: J. B. Cooper, G. R. von Tungeln

Assistant Professors: R. K. DeHaven, M. W. Jutras, B. J. Skelton

Ag 101—Introduction to Agriculture—1 cr. (1 and 0) F, S
Guides to effectively study; agricultural sciences; scope of the agricultural industry; agriculture of South Carolina and the United States; organizations and function of the land-grant institution and other agencies serving agriculture; career opportunities.

Ag 201—Introduction to Animal Industries—3 cr. (2 and 3) F, S
Fundamental and descriptive aspects of the animal industries as applied biology and major segments of food production and distribution systems. The subject matter will be presented by Animal Science, Dairy Science, and Poultry Science Departments.

Ag 202—Introduction to Plant Sciences—3 cr. (2 and 3) F, S
A fundamental course in plant sciences, including Agronomic and Horticultural crops of the major agricultural areas of the world, and emphasizing the crops of South Carolina. Included in the laboratory exercises are applications of the basic biological concepts of morphology, heredity, physiology and ecology to the production of food, fiber and ornamentals for an expanding population.

AG 301—INTERNATIONAL AGRICULTURE—3 cr. (3 and 0) F

This course is designed to acquaint the student with current international agriculture. Topics covered include: international agricultural production and consumption patterns, stage of agricultural and industrial development in various countries of the world, current and projected future production-consumption-population balance, world trade patterns in agricultural products, world agricultural marketing problems (including tariffs, balance of trade, import quotas, and common markets). Also included are allied subjects such as population trends and agricultural mechanization.

AG 401—INTERNATIONAL AGRICULTURE SEMINAR—1 cr. (1 and 0) S

This seminar will be directed toward current topics in international agriculture. Seminar speakers will include invited guests from such agencies as the Foreign Agricultural Service, the Food and Agriculture Organization, The Ford Foundation, the Rockefeller Foundation, and the Agency for International Development. Other speakers will include staff members in the College of Agriculture and Biological Sciences that have had foreign assignments in their professional fields. Some sessions will be devoted specifically to employment opportunities in international agriculture.

AGRONOMY—CROPS AND SOILS

Professors: G. R. CRADDOCK, C. M. JONES, U. S. JONES, *Head;* T. C. PEELE

Associate Professors: E. B. ESKEW, K. S. LAFLEUR, B. J. GOSSETT

Assistant Professors: W. D. GRAHAM, M. W. JUTRAS, J. D. MAXWELL, C. E. RIECK, J. R. WOODRUFF

AGRON 202—SOILS—3 cr. (2 and 2) F, S

A basic foundation in soil science is presented with emphasis on the chemical and physical properties of soil, the activities of the living soil organisms, and the origin and classification of soils. *Prerequisite:* Ch 101 and 102.

AGRON 301—FERTILIZERS—3 cr. (3 and 0) F

Sources, mining and manufacture, composition, physical characteristics, and use of fertilizers. A detailed study is made of crop responses to fertilizer use. *Prerequisite:* Agron 202.

AGRON 308—SOIL AND PLANT ANALYSIS—3 cr. (1 and 6) S

A laboratory study of the physical and chemical properties of soils and methods of their determination. The relation of these properties to the potential fertility and management of soils is emphasized. Methods of plant analysis and the use of plant analysis data as a diagnostic tool in plant nutrition is also studied. *Prerequisite:* Agron 202.

AGRON 310—FORAGE AND PASTURE CROPS—3 cr. (3 and 0) S

The characteristics, establishment, utilization and maintenance of crops for hay, silage, and pasture. Crops valuable in South Carolina are emphasized. *Prerequisite:* Ag 202, Agron 202 or consent of instructor.

AGRON 312—FORAGE CROPS LABORATORY—1 cr. (0 and 2) S

Identification, rating, and management of the important forage and pasture species of the Southeast. *Prerequisite:* Ag 202.

AGRON 403—SOIL GENESIS AND CLASSIFICATION—2 cr. (1 and 3) F

Theoretical and practical phases of soil survey, formation and classification in relation to land usage and plant adaptability. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 405—PLANT BREEDING—3 cr. (2 and 2) S

The application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. *Prerequisite:* Gen 302.

AGRON 407—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2) F

Weeds, their introduction, ecology, methods of reproduction, dissemination, and control; chemistry and mode of action of herbicides, equipment and techniques of application; a characterization of the common weeds of the Southeast. *Prerequisite:* Ag 202, Agron 202 or consent of instructor.

AGRON 410—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0)
F, '71 and alternate years.

History, morphology, physiology, and fundamental principles and practices of production, harvesting, marketing, processing, and utilization of cotton and certain other fiber crops. Emphasis will be placed on the effect of environmental and production factors as they affect fiber quality and subsequent utilization. *Prerequisite:* Ag 202, Agron 202 or consent of instructor.

AGRON 411—GRAIN CROPS—2 cr. (2 and 0) F, '70 and alternate years.

A fundamental study involving principles of production, harvesting processing, marketing, and untilization of soybeans, corn, sorghum, and the small grains. Emphasis will be placed on factors affecting grain quality as related to utilization of grain. *Prerequisite:* Ag 202, Agron 202 or consent of instructor.

AGRON 412—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0)
S, '72 and alternate years.

Principles involved in the production, harvesting, curing, grading and marketing of high quality flue-cured tobacco. Brief coverage of special use crops, such as peanuts, sugar cane, etc. *Prerequisite:* Ag 202, Agron 202 or consent of instructor.

AGRON 452—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0) S

Principles of crop rotations, soil fertility, soil management, and other factors necessary for the practical utilization of soils. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 455—SEMINAR—1 cr. (1 and 0) F

Student presentation of current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

AGRON 456—SEMINAR—1 cr. (1 and 0) S

Student presentation of current topics of special interest in the field of soil science appearing in recent scientific journals and other publications.

AGRON 601—FERTILIZERS—3 cr. (3 and 0)

AGRON 608—SOIL AND PLANT ANALYSIS—3 cr. (1 and 6)

AGRON 610—FORAGE AND PASTURE CROPS—3 cr. (3 and 0)

AGRON 612—FORAGE CROPS LABORATORY—1 cr. (0 and 2)

AGRON 703—SOIL GENESIS AND CLASSIFICATION—2 cr. (1 and 3)

AGRON 705—PLANT BREEDING—3 cr. (2 and 2)

AGRON 707—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2)

AGRON 710—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0)

AGRON 711—GRAIN CROPS—2 cr. (2 and 0)

AGRON 712—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0)

AGRON 752—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0)

AGRON 755—SEMINAR—1 cr. (1 and 0)

AGRON 756—SEMINAR—1 cr. (1 and 0)

AGRON 801—CROP PHYSIOLOGY AND NUTRITION—3 cr. (3 and 0)

AGRON 802—PEDOLOGY AND SOIL CLASSIFICATION—3 cr. (2 and 3)

AGRON 804—THEORY AND METHODS OF PLANT BREEDING—3 cr. (3 and 0)

AGRON 805—SOIL FERTILITY—3 cr. (3 and 0)

AGRON 806—SPECIAL PROBLEMS—Credit to be arranged—1-3 cr.

AGRON 807—SOIL PHYSICS—3 cr. (2 and 3)

AGRON 808—SOIL CHEMISTRY—3 cr. (2 and 3)

AGRON 812—CROP ECOLOGY AND LAND USE—3 cr. (3 and 0)

AGRON 820—PESTICIDE RESIDUES IN THE ENVIRONMENT—3 cr. (3 and 0)

AGRON 825—SEMINAR—1 cr. (1 and 0)

AGRON 891—RESEARCH—Credit to be arranged.

AGRON 991—DOCTORAL RESEARCH AND THESIS—Credit to be arranged.

ANIMAL PHYSIOLOGY

Professors: T. R. ADKINS, JR., B. D. BARNETT, M. A. BOONE, V. HURST, W. A. KING, R. F. WHEELER

Associate Professors: R. F. BORGMAN, J. F. DICKEY, S. B. HAYS, J. R. HILL, JR., A. S. TOMBES

Assistant Professors: RUTH L. HAYS, D. M. HENDRICKS

Visiting Professor: D. R. LAMOND

(See courses listed under Animal Science, Dairy Science, Entomology, Poultry Science, and Zoology)

AN PH 802—VERTEBRATE PHYSIOLOGY—3 cr. (2 and 3)

AN PH 803—ANIMAL PHYSIOLOGY—4 cr. (3 and 3)

AN PH 804—ANIMAL PHYSIOLOGY—4 cr. (3 and 3)

AN PH 805—PHARMACOLOGY—3 cr. (2 and 3)

AN PH 806—EXPERIMENTAL ANIMAL PHYSIOLOGY—3 cr. (1 and 6)

AN PH 808—MAMMALIAN AND AVIAN ENDOCRINOLOGY—3 cr. (3 and 0)

An Ph 851—Animal Physiology Seminar I—1 cr. (1 and 0)

An Ph 852—Animal Physiology Seminar II—1 cr. (1 and 0)

An Ph 991—Doctoral Research—Credit to be arranged.

ANIMAL SCIENCE

Professors: W. C. Godley, R. R. Ritchie, R. F. Wheeler, *Head*
Associate Professors: R. L. Edwards, J. R. Hill, Jr., G. C. Skelley
Assistant Professor: D. L. Handlin

An Sc 201—Introduction to Animal Science—2 cr. (2 and 0)
This course deals with basic principles concerning the breeding, feeding, management and marketing of beef cattle, swine, sheep and horses.

An Sc 203—Introduction to Animal Science Laboratory—1 cr. (0 and 3)
A course designed to demonstrate the basic elements of livestock breeding, feeding and management. Beef cattle, swine, sheep and horses will be used. Evaluation of slaughter animals and carcasses is included.

An Sc 301—Feeds and Feeding—3 cr. (3 and 0) F, S
Feed nutrients, digestion, metabolism of feed stuffs, nutritive ratios, feeding standards, and the balancing or rations. *Prerequisite:* An Sc 201, 203 or equivalent and Ch 220 or consent of instructor.

An Sc 303—Feeds and Feeding Laboratory—1 cr. (0 and 3) S
Practical work in mixing and balancing rations and identifying feed stuffs. *Prerequisite:* An Sc 201, 203 or equivalent and Ch 220 or consent of instructor.

An Sc 305—Meat Grading and Selection—2 cr. (1 and 3)
F, '70 and alternate years.
Classification, grading and selection of beef, lamb and pork carcasses and wholesale cuts. Factors influencing quality and value. Students enrolled in this course are eligible to compete in Intercollegiate Meat Judging Contests. *Prerequiiste:* An Sc 201, 203.

An Sc 306—Livestock Selection and Evaluation—2 cr. (1 and 3) S
Selection, breed characteristics and grading of beef cattle, sheep and swine. Students enrolled in this course are eligible to compete in the Southeastern Intercollegiate Livestock Judging Contest. *Prerequisite:* An Sc 201, 203.

An Sc 353—Meats—2 cr. (2 and 0) F
The chemical and physical composition of meat, meat hygiene; nutritive value; curing; freezing; and meat by-products. *Prerequisite:* An Sc 201, 203.

An Sc 355—Meats Laboratory—1 cr. (0 and 3) F
The selection and grading of meat animals and carcasses. Practical work in slaughtering of animals and in the cutting, curing and freezing of meats. Emphasis is placed on the identification of wholesale and retail cuts. *Prerequisite:* An Sc 201, 203.

An Sc 401—Beef Production—3 cr. (3 and 0) F
Breeding, feeding, management and grading of beef cattle. Emphasis is placed on year-round grazing. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 403—BEEF PRODUCTION LABORATORY—1 cr. (0 and 3) F
Practical application of beef production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 405—ADVANCED LIVESTOCK SELECTION AND EVALUATION—1 cr. (0 and 3) F, '71 and alternate years.
A continuation of An Sc 306 for students who are interested in participating in judging contests or in receiving special training in the selection of breeding cattle, sheep and swine. Judging and grading of market classes are considered. *Prerequisite:* An Sc 306.

AN SC 406—SEMINAR—2 cr. (2 and 0) S
Special problems in animal production. Each student is given a subject on which he makes weekly reports before a seminar group. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 407—HORSE AND SHEEP PRODUCTION—2 cr. (2 and 0) F, '70 and alternate years.
The breeding, feeding and care of horses and sheep; the shearing and marketing of sheep and wool; the adaptability of breeds; and parasite and disease control. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 408—PORK PRODUCTION—3 cr. (3 and 0) S
Feeding, breeding, management, and marketing of hogs. Emphasis is placed on winter and summer forages, protein supplements, mineral mixtures, and sanitation practices. In laboratory grading, selection, feeding, management and care of swine is given attention. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 409—HORSE AND SHEEP PRODUCTION LABORATORY—1 cr. (0 and 3) F, '70 and alternate years.
Horse and sheep production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 410—PORK PRODUCTION LABORATORY—1 cr. (0 and 3) S
Practical application of swine production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 452—ANIMAL BREEDING—3 cr. (3 and 0) S
The fundamental principles relating to the breeding and improvement of livestock including variation, heredity, selection, linebreeding, inbreeding, crossbreeding and other related subjects. *Prerequisite:* Gen 302.

AN SC 701—BEEF PRODUCTION—3 cr. (3 and 0)

AN SC 703—BEEF PRODUCTION LABORATORY—1 cr. (0 and 3)

AN SC 708—PORK PRODUCTION—3 cr. (3 and 0)

AN SC 710—PORK PRODUCTION LABORATORY—1 cr. (0 and 3)

AN SC 752—ANIMAL BREEDING—3 cr. (3 and 0)

AN SC 802—TOPICAL PROBLEMS—1-3 cr. (1-3 and 0)

AN SC 803—MEAT TECHNOLOGY—3 cr. (3 and 0)

AN SC 804—METHODS IN ANIMAL BREEDING—3 cr. (3 and 0)

AN SC 805—NUTRITION OF MEAT ANIMALS—3 cr. (3 and 0)

AN SC 891—RESEARCH—Credit to be arranged.

ARCHITECTURE

Professors: H. N. COOLEDGE, E. L. FALK, E. A. GUNNIN, R. H. HUNTER, H. E. MCCLURE, G. C. MEANS, J. L. YOUNG

Associate Professors: J. T. ACORN,* L. H. BROWN, R. ENGLAND, V. S. HODGES, A. J. KAUFMANN, R. E. KNOWLAND, P. LEE, M. G. MALARAGNO, J. E. PINCKNEY, I. G. REGNIER, J. W. WELLS, H. H. WILLIAMSON

Assistant Professors: K. E. CARPENTER, J. MCN. CLEMENT, J. DALTON, K. RUSSO, S. WANG, J. R. WASHBURN, D. WADDELL

Lecturers: S. CARTER, K. R. CRAIG, F. P. MORRIS

Visiting Professor: T. K. DORUK, G. A. ROWE

Associate Visiting Professor: R. D. BRAY

ARCH 101—AN INTRODUCTION TO ART AND ARCHITECTURE—3 cr. (1 and 6)
Studies of architecture and the visual arts with adjunct studio exercises.

ARCH 102—AN INTRODUCTION TO ART AND ARCHITECTURE—3 cr. (1 and 6)
Studies of architecture and the visual arts with adjunct studio exercises. *Prerequisite:* Arch 101.

ARCH CONST 141–ELEMENTS OF BUILDING I—4 cr. (2 and 6)
An introduction to the principles of building construction. Exercises in graphics, slide rule, print reading and interpretation. Lectures in building materials, building codes, safety, and basic construction methods.

ARCH CONST 142—ELEMENTS OF BUILDING II—4 cr. (2 and 6)
A continuation of Arch Const 141. *Prerequisite:* Arch Const 141.

ARCH CONST 241—ELEMENTS OF BUILDING III—4 cr. (2 and 6)
Interpretation and analysis of working drawings and specifications of selected building projects. Principles of estimating procedures with emphasis on quantity surveys and construction organization and planning. *Prerequisite:* Arch Const 142.

ARCH CONST 242—ELEMENTS OF BUILDING IV—4 cr. (2 and 6)
Continuation of Arch Const 241. *Prerequisite:* Arch Const 241.

ARCH 253—BASIC DESIGN I—4 cr. (1 and 9)
Studio problems in visual fundamentals, including graphic representations and adjunct lectures in visual theory. *Prerequisite:* Arch 102; *corequisite:* Math 206.

ARCH 254—ARCHITECTURAL DESIGN II—4 cr. (1 and 9)
Studio problems in the elements of architecture, basic site development, and three-dimensional representation. *Prerequisite:* Arch 253; *corequisite:* EM 201.

ARCH 302—ART AND ARCHITECTURE TOUR—3 cr. (3 and 0)
A tour of selected cities, either foreign or American, will be organized periodically primarily in a Summer Session. The purpose of the tour is to provide students with firsthand experience with the dynamic qualities of original works of painting and sculpture and especially the spatial qualities of architecture and the relationships of great works of architecture to their environment. The tour will be accompanied by lectures and will require examinations and/or reports.

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* On leave.

Arch 303—The Evolution of the Visual Arts—3 cr. (3 and 0)
A consideration of man's necessity for and development of the Visual Arts with particular attention to the environmental factors in society which demand Art as a medium of communication. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* Sophomore standing.

Arch 304—The Evolution of the Environmental Arts—3 cr. (3 and 0)
A consideration of man's necessity for and development of the Environmental Arts (Architecture, Landscape Architecture, City and Regional Planning) with particular attention to the Total Environment of Man and its demands and restrictions upon the architect and planner. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* Arch 303 or special permission of instructor.

Arch 315—Architectural History I—3 cr. (3 and 0)
The architectural history of Western man from 1500 B.C. to A.D. 323, with particular attention to Egypt, Greece, Mesopotamia, and Rome.

Arch 316—Architectural History II—3 cr. (3 and 0)
The architectural history of Europe and the Near East from A.D. 323 to 1453, with particular attention to the Byzantine, pre-Romanesque, Romanesque, and Gothic schools of Western Europe. *Prerequisite:* Arch 315.

Arch 331—Architectural Applications of Computer Science—2-2 cr. (2 each)
A two-semester course sequence, including computer theory and programming. Architectural applications of the computer as a resource will be studied; including use in problem solving in functional relationships of space, materials performance specifications, structural design and graphic usage.

Arch 332—Architectural Applications of Computer Science—2-2 cr. (2 each)
A continuation of Arch 331. *Prerequisite:* Arch 331.

Arch Const 341—Building Construction I—4 cr. (2 and 6)
A study of building construction projects with emphasis on labor relations and jurisdiction, job planning, scheduling, and project control. *Prerequisite:* Arch Const 242.

Arch Const 342—Building Construction II—4 cr. (2 and 6)
A continuation of Arch Const 341. *Prerequisite:* Arch Const 341.

Arch 353—Architectural Design III—5 cr. (1 and 12)
Intermediate architectural design problems involving programming and considerations of function, structure and aesthetics. *Prerequisite:* Arch 254; *corequisite:* EM 304.

Arch 354—Architectural Design IV—5 cr. (1 and 12)
Continuation of Arch 353. *Prerequisite:* Arch 353; *corequisite:* CE 301.

Arch 415—Architectural History III—3 cr. (3 and 0)
The architectural history of Western Europe and the Americas from 1453 to 1775, with particular attention to the Renaissance, Baroque, and Revivalist schools. *Prerequisite:* Arch 316.

ARCH 416—ARCHITECTURAL HISTORY IV—3 cr. (3 and 0)
The architectural history of Western Europe and the Americas from 1775 to 1915 with particular attention to the architecture of the Industrial Revolution and the development of the academies. *Prerequisite:* Arch 415.

ARCH CONST 432—CONCRETE FORMWORK—2 cr. (2 and 0)
The study of materials, methods, design and estimating of formwork for concrete structures. *Prerequisite:* CE 301.

ARCH CONST 441—BUILDING CONSTRUCTION III—4 cr. (2 and 6)
A study of contractor organization and administration including contracts, insurance, bonds, financing, equipment, office procedures, and records. *Prerequisite:* Arch Const 342.

ARCH CONST 442—BUILDING CONSTRUCTION IV—4 cr. (2 and 6)
A continuation of Arch Const 441. *Prerequisite:* Arch Const 441.

ARCH 453—ARCHITECTURAL DESIGN V—5 cr. (1 and 12)
Consideration of design problems involving programming of urban structures with adjunct lectures in design principles, construction and theory. *Prerequisite:* Arch 354; *corequisite:* CE 302.

ARCH 454—ARCHITECTURAL DESIGN VI—5 cr. (1 and 12)
Continuation of Arch 453. *Prerequisite:* Arch 453; *corequisite:* CE 402.

ARCH 490—DIRECTED STUDIES—1-5 cr.
Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in architecture.

ARCH 503—SEMINAR IN THE ANALYSIS AND CRITICISM OF ARCHITECTURAL AND TOWN BUILDING WORKS—3 cr. (3 and 0)
A seminar in the analysis and criticism of architectural and town building works. The course sequence will include historic and contemporary examples, literary searches, field trips, essays and oral reports. Fourth-year-design standing or permission of instructor.

ARCH 515—CONSTRUCTION METHODS—2 cr. (2 and 0)
A course relating contemporary construction methods with considerations of function, aesthetics and economics. *Prerequisite:* Fourth-year standing.

ARCH 517—STUDIES IN THE ART AND ARCHITECTURE OF THE ANCIENT WORLD I—3 cr. (3 and 0) F
A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece and Rome), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and History 203, 204, all with a grade of "B" or better.

ARCH 518—STUDIES IN THE ART AND ARCHITECTURE OF THE ANCIENT WORLD II—3 cr. (3 and 0) S
A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece and Rome), with a study in depth of selected examples from the period. *Prerequisite:* Arch 517, or with the permission of the instructor and the prerequisites for Arch 517.

ARCH 519—STUDIES IN THE ART AND ARCHITECTURE OF THE EARLY MIDDLE AGES I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and History 203, 204, all with a grade of "B" or better.

ARCH 520—STUDIES IN THE ART AND ARCHITECTURE OF THE EARLY MIDDLE AGES II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 519, or with the permission of the instructor and the prerequisites for Arch 519.

ARCH 521—STUDIES IN THE ART AND ARCHITECTURE OF THE LATE MIDDLE AGES I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and History 203, 204, all with a grade of "B" or better.

ARCH 522—STUDIES IN THE ART AND ARCHITECTURE OF THE LATE MIDDLE AGES II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 521, or with the permission of the instructor and the prerequisites for Arch 521.

ARCH 523—STUDIES IN THE ART AND ARCHITECTURE OF THE RENAISSANCE I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and History 203, 204, all with a grade of "B" or better.

ARCH 524—STUDIES IN THE ART AND ARCHITECTURE OF THE RENAISSANCE II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 523, or with the permission of the instructor and the prerequisites for Arch 523.

ARCH 525—STUDIES IN THE ART AND ARCHITECTURE OF THE TECHNOLOGICAL REVOLUTION I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of the Technological Revolution (Western Europe and America from 1685 to 1935), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and History 203, 204, all with a grade of "B" or better.

ARCH 526—STUDIES IN THE ART AND ARCHITECTURE OF THE TECHNOLOGICAL REVOLUTION II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of the Technological Revolution (Western Europe and America from 1685 to 1935), with a study in depth of selected examples from the period. *Prerequisite:* Arch 525, or with the permission of the instructor and the prerequisites for Arch 525.

ARCH 527—STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL TECHNOLOGY I—3 cr. (3 and 0) F

A consideration of the development of architectural technology from ancient through contemporary times with a study in depth of selected examples from each period. *Prerequisite:* Open to students who have completed Architectural History I-IV and to other students with senior standing and permission of the instructor.

ARCH 528—STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL TECHNOLOGY II—3 cr. (3 and 0) S

A consideration of the development of architectural technology from ancient through contemporary times with a study in depth of selected examples from each period. *Prerequisite:* Open to students who have completed Architectural History I-IV and to other students with senior standing and permission of the instructor.

ARCH 529—STUDIES IN THE ART AND ARCHITECTURE OF INDIA AND THE FAR EAST I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and History 203, 204, all with a grade of "B" or better.

ARCH 530—STUDIES IN THE ART ND ARCTITECTURE OF INDIA AND THE FAR EAST II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period. *Prerequisite:* Arch 529, or with the permission of the instructor and the prerequisites for Arch 529.

ARCH 553—ADVANCED ARCHITECTURAL STRUCTURES—4 cr. (1 and 9)

A course in the synthesis of advanced architectural construction and structural analysis. *Prerequisite:* Arch 515 and CE 302.

ARCH 575—MECHANICAL PLANT—2 cr. (2 and 0)

The water supply, plumbing, heating and ventilating systems of present-day buildings.

ARCH 576—MECHANICAL PLANT—2 cr. (2 and 0)

Air-conditioning, electrical systems, lighting, mechanical transportation and acoustics as applied to contemporary buildings. *Prerequisite:* Arch 575.

ARCH 581—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)

General consideration of architectural office procedure. Study of the professional relationship of the architect to client and contractor, including problems of ethics, law, and business.

ARCH 582—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)

A continuation of Arch 581. *Prerequisite:* Arch 581.

Arch 591—Architectural and Town Planning Design—11 cr. (5 and 18)
Lectures and studio problems in advanced architectural design and Town Planning. Course content will include pre-thesis studies. *Prerequisite:* Arch 454 with C standing.

Arch 592—Architectural Thesis—11 cr. (5 and 18)
The student working individually will carefully program an environmental problems of appropriate scope, and conduct his own comprehensive research. He will make a complete oral, written and visual presentation of his solution. *Prerequisite:* Arch 591.

Arch 593—Structural Thesis Research—5 cr. (0 and 15)
Studio and laboratory research studies preliminary to undertaking a thesis in Architectural Structures. *Prerequisite:* Arch 553.

Arch 594—Thesis in Architectural Structures—11 cr. (5 and 18)
The student working individually with laboratory and lecture support will prepare and present a structural thesis of appropriate scope and complexity. *Prerequisite:* Arch 593.

Arch 611—Directed Research in Art History—3 cr. (3 and 0)

Arch 612—Directed Research in Art History—3 cr. (3 and 0)

Arch 615—Structural Methods—2 cr. (2 and 0)

Arch 653—Advanced Architectural Construction—4 cr. (1 and 9)

Arch 811—Town Planning Theory—3 cr. (3 and 0)

Arch 812—Town Planning Theory—3 cr. (3 and 0)

Arch 853—Graduate Design—8 cr. (0 and 24)

Arch 854—Graduate Design—8 cr. (0 and 24)

Arch 855—Thesis Research—2 cr. (0 and 6)

Arch 857—Graduate Design—10 cr. (4 and 18)

Arch 858—Architectural Thesis—17 cr. (5 and 36)

Arch 861—Economics Seminar—3 cr. (3 and 0)

Arch 875—Mechanical Plant—2 cr. (2 and 0)

Arch 876—Mechanical Plant—2 cr. (2 and 0)

Arch 881—Office Practice—2 cr. (2 and 0)

Arch 882—Office Practice—2 cr. (2 and 0)

Arch 890—Directed Studies—1-5 cr.

Arch 891—Architectural Structural Seminar—2 cr. (2 and 0)

Arch 892—Architectural Structural Seminar—2 cr. (2 and 0)

Arch 893—Architectural Structural Seminar—2 cr. (2 and 0)

BIOCHEMISTRY

Professors: J. H. Mitchell, Jr., W. P. Williams, Jr., *Head*

Associate Professors: R. F. Borgman, D. E. Turk

Assistant Professors: L. Crook, D. M. Henricks, J. J. Jen

(See biochemistry courses listed under Chemistry)

Bioch 406—Physiological Chemistry—4 cr. (3 and 3) S

Chemistry of the physiological processes of respiration, digestion, membrane transport, blood and tissue homeostatis, and kidney function is studied. Current literature on these processes is studied and interpretations discussed. *Prerequisite:* Ch 310 or Ch 423.

Bioch 706—Physiological Chemistry—4 cr. (3 and 3)

Bioch 810—Advanced Biochemical Techniques—3 cr. (1 and 6)

Bioch 812—Nutritional Biochemistry—3 cr. (3 and 0)

Bioch 814—Laboratory Methods in Nutrition—1 cr. (0 and 3)

Bioch 815—Lipids—2 cr. (2 and 0)

Bioch 816—Proteins and Nucleic Acids—3 cr. (3 and 0)

Bioch 817—Chemistry and Metabolism of Hormones—2 cr. (2 and 0)

Bioch 818—Vitamins and Minerals—3 cr. (3 and 0)

Bioch 819—Intermediary Metabolism—3 cr. (3 and 0)

Bioch 851—Biochemistry Seminar—1 cr. (1 and 0)

Bioch 852—Biochemistry Seminar—1 cr. (1 and 0)

Bioch 891—Research—Credit to be arranged.

BIOENGINEERING

Professor: H. R. Bungay III

Associate Professors: S. F. Hulbert, *Program Coordinator;* M. J. Eitel, R. S. Mathews

Adjunct Professor: F. H. Stelling

BioE 301—Engineering Aspects of Biology and Medicine—2 cr. (2 and 0)

The relationships of various branches of engineering to biology and medicine. Structural engineering fluid flow, and mass transfer in living systems. Artificial organs, biomaterials, implants, instrumentation, microbial systems, and other engineering challenges are discussed.

BioE 401—Computers for Bioscientists—3 cr. (2 and 3)

Analog and elementary digital computer techniques applied to processes in biology and biochemistry. The emphasis is simulation in modeling, not advanced mathematics or statistics. *Prerequisite:* One year of college mathematics, preferably calculus; closed to Engineering students.

BioE 701—Computers for Bioscientists—3 cr. (2 and 3)

BioE 800—Seminar in Bioengineering—1 cr. (1 and 0)

BioE 801—Biomaterials—3 cr. (3 and 0)

BioE 810—Biochemical Engineering—3 cr. (3 and 0)

BioE 846—Elements of Bioengineering I—3 cr. (3 and 0)

BioE 847—Elements of Bioengineering II—3 cr. (3 and 0)

BioE 850—Special Topics in Biomedical Engineering—3 cr. (3 and 0)

BioE 891—Research—Credit to be arranged.

BioE 991—Doctoral Research—Credit to be arranged.

BIOLOGY

(*For curriculums and offerings of sections of the Division of Biology see also Botany, Microbiology, and Zoology*)

Professor: R. K. Guthrie, *Director*

Biol 450—Biology for High School Teachers—3 cr. (3 and 0) SS

The fundamental principles of biological processes are reviewed and expanded. Demonstrations, preparations, illustrations, and experiments suitable for use in high school teaching are emphasized. Expressly designed for biology teachers in the secondary schools.

Biol 750—Biology for High School Teachers—3 cr. (3 and 0)

Biol 800—Principles of Biology—3 cr. (2 and 3)

BOTANY

(See also Biology)

Professors: R. P. Ashworth, W. M. Epps, *Chairman;* A. C. Mathews, R. W. Rutledge, J. B. Whitney, Jr.

Assistant Professors: N. D. Camper, J. E. Fairey III

Instructor: Neina W. Thompson

Bot 101—General Botany—4 cr. (3 and 3) F, S, SS

The form, structure and physiology of the higher plants, followed by the algae, bacteria, fungi, liverworts, mosses and ferns, with the application of the biological laws. Descriptions, life histories and adaptation of representative organisms.

Bot 202—Survey of the Plant Kingdom—4 cr. (3 and 3) S

A survey of the major groups of plants, their structure, development, and reproduction. Evolutionary relationships as exemplified by comparisons of body organization and life cycles will be emphasized. *Prerequisite:* Bot 101.

Bot 352—Plant Physiology—4 cr. (3 and 3) F, S

The relations and processes which have to do with the maintenance, growth and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. *Prerequisite:* Bot 101; Ch 101 and 102; Phys 201 and 203 or Phys 211 and 213.

Bot H352—Plant Physiology—4 cr. (3 and 3) F, S

Honors option for Bot 352, admission by special arrangement.

BOT 355—HISTOLOGY—2 cr. (0 and 6)
The principles of fixing, cutting and staining plant tissues and the various other processes of micro-technique and their application to specific forms of plants. *Prerequisite:* Bot 101; Ch 101 and 102.

BOT 356—TAXONOMY OF VASCULAR PLANTS—3 cr. (1 and 6) S
The identification, classification, distribution and interrelationship of vascular plants with emphasis on the flora of South Carolina. *Prerequisite:* Bot 101.

BOT H356—TAXONOMY OF VASCULAR PLANTS—3 cr. (1 and 6) S
Honors option for Bot 356, admission by special arrangement.

BOT 404—CYTOLOGY—3 cr. (3 and 0) F, '71 and alternate years.
A detailed consideration of the morphology and ultrastructures of cells. *Prerequisite:* Bot 352, Zool 101, 103, or permission of instructor.

BOT H404—CYTOLOGY—3 cr. (3 and 3) F, '71 and alternate years.

BOT 406—PLANT ANATOMY—3 cr. (2 and 3) F, '70 and alternate years.
The origin and development of the organs and tissue systems of vascular plants and a comparative study of the structure of roots, stems, leaves, flowers, and fruits. *Prerequisite:* Bot 101.

BOT H406—PLANT ANATOMY—3 cr. (2 and 3) F, '70 and alternate years.
Honors option for Bot 406, admission by special arrangement.

BOT 451—MORPHOLOGY OF THE FUNGI—3 cr. (2 and 3)
F, '70 and alternate years.
The morphology and taxonomy of the fungi, with special emphasis on species of economic importance. *Prerequisite:* Bot 101.

BOT 452—PLANT ECOLOGY—3 cr. (3 and 0) S, '70 and alternate years.
The fundamental principles of the relations between plants and their environment. *Prerequisite:* Bot 101.

BOT H452—PLANT ECOLOGY—3 cr. (3 and 0) S, '70 and alternate years.
Honors option for Bot 452, admission by special arrangement.

BOT 457—PHYCOLOGY—3 cr. (2 and 3) S, '71 and alternate years.
The taxonomy, morphology, and ecology of freshwater algae with emphasis on the local flora. *Prerequisite:* Bot 101 or permission of instructor.

BOT H457—PHYCOLOGY—3 cr. (2 and 3) S, '71 and alternate years.
Honors option for Bot 457, admission by special arrangement.

BOT 652—PLANT PHYSIOLOGY—4 cr. (3 and 3)

BOT 656—TAXONOMY OF VASCULAR PLANTS—3 cr. (1 and 6)

BOT 704—CYTOLOGY—3 cr. (3 and 0)

BOT 706—PLANT ANATOMY—3 cr. (2 and 3)

BOT 751—MORPHOLOGY OF THE FUNGI—3 cr. (2 and 3)

BOT 752—PLANT ECOLOGY—3 cr. (3 and 0)

BOT 757—PHYCOLOGY—3 cr. (2 and 3)

BOT 802—MYCOLOGY—4 cr. (3 and 3)

BOT 805—SPECIAL PROBLEMS IN BOTANY—Credit to be arranged.

Bot 807—Seminar—1 cr. (1 and 0)

Bot 811—Inorganic Plant Metabolism—4 cr. (3 and 3)

Bot 812—Organic Plant Metabolism—3 cr. (3 and 0)

Bot 813—Plant Growth and Development—3 cr. (3 and 0)

Bot 821—Plant Taxonomy I—4 cr. (2 and 6)

Bot 822—Plant Taxonomy II—4 cr. (2 and 6)

Bot 891—Research—Credit to be arranged.

Bot 991—Doctoral Research—Credit to be arranged.

CERAMIC ARTS

Professor: G. C. Robinson

Cr Ar 101—Pottery Materials—3 cr. (2 and 3)
The occurrence and properties of pottery raw materials. Attention is devoted to the occurrence of natural pottery materials in South Carolina, and the methods and equipment used in preparing these materials.

Cr Ar 102—Pottery Drying and Firing—3 cr. (3 and 0)
The drying and firing processes used in pottery making. A discussion is included on the design and construction of simple pottery kilns and the student is required to build and operate a small outdoor kiln. The laboratory work demonstrates the drying and firing behavior of pottery.

Cr Ar 301—Pottery Glazes—3 cr. (3 and 0)
The materials and methods used in preparing glazes and a study of the methods used in decorating pottery products. *Prerequisite:* Cr Ar 101 and 102.

Cr Ar 401—Advanced Pottery—3 cr. (2 and 3)
The student is given advanced training in pottery techniques and pottery equipment. *Prerequisite:* Cr Ar 101 and 102.

CERAMIC ENGINEERING

Professors: G. C. Robinson, *Head;* H. H. Wilson

Associate Professors: C. C. Fain, H. G. Lefort

Assistant Professor: W. W. Coffeen

CrE 201—Introduction to Ceramic Engineering—2 cr. (2 and 0)
An introduction to ceramic engineering together with a study of ceramic forming operation. Exercises are provided in the analysis of processing problems, the evaluation of background information and the creation of new solutions to processing problems.

CrE 202—Ceramic Materials—3 cr. (3 and 0)
The properties and uses of commonly used ceramic materials. Equilibrium diagrams are used to gain an understanding of the effect of heat on the materials.

CrE 204—Laboratory Procedures—1 cr. (0 and 3)
An introduction to ceramic laboratory procedures. Primary consideration will be given to the evaluation of sources of error and signifiance of measurement in the major ceramic test procedures.

CRE 299—DIGITAL COMPUTATION—1 cr. (0 and 3)
An introduction to digital computer programming for students majoring in Ceramic Engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in ceramic engineering. *Prerequisite:* Sophomore standing.

CRE 302—THERMO-CHEMICAL CERAMICS—3 cr. (3 and 0)
High-temperature equilibrium using the laws of physical chemistry as applied to ceramic systems in both solid and liquid states. An introduction to the crystal chemistry of ceramic raw materials, and the effect of crystalline form on their high-temperature behavior.

CRE 303—CERAMIC PRODUCTS—2 cr. (2 and 0)
The application of ceramic products to a variety of use environments. Refractories, structural ceramics, coated metals and corrosion resistant products are included. The course is for both engineering and non-engineering majors.

CRE 304—EXPERIMENT DESIGN—1 cr. (0 and 3)
An exercise in the planning and organization of experiments in the ceramic field.

CRE 306—FUELS COMBUSTION AND HEAT TRANSFER—1 cr. (0 and 3)
Combustion devices, the calculation of combustion problems and heat transfer.

CRE 307—THERMAL PROCESSING OF CERAMICS—3 cr. (3 and 0)
The accomplishment of changes in structure and composition through the application of thermal energy. The course includes a study of simultaneous transfer of heat and mass, fluid flow, determinants of rates in a variety of reactions and calculations of the energy requirements to accomplish change in structure or composition.

CRE 309—RESEARCH METHODS—2 cr. (0 and 6)
The planning and solution of selected research problems.

CRE 310—INTRODUCTION TO MATERIAL SCIENCE—3 cr. (3 and 0)
A beginning course in material science designed primarily for engineering students. The course is a study of the relation between the electrical, mechanical and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms.

CRE 402—SOLID STATE CERAMICS—3 cr. (3 and 0)
The effects of the composition, form, and shape of ceramic raw materials on the manufacturing processes and final properties of ceramic products. Included are fundamental studies of such phenomena as deflocculation, plasticity, sintering and the behavior of ceramic products in electrical circuits. *Prerequisite:* Junior standing.

CRE 403—GLASSES—3 cr. (3 and 0)
Glass structure and composition and their relation to the properties of glasses. Consideration is given to the processing variables which control the properties of glasses including glass products, enamels, glazes and vitreous bonds.

CRE 404—CERAMIC COATINGS—3 cr. (3 and 0)
The raw materials, methods of manufacture, and properties of ceramic coatings. *Prerequisite:* CrE 302.

CrE 406—Ceramic Project—2 cr. (0 and 6)
The completion of an original research into a ceramic problem. *Prerequisite:* CrE 302.

CrE 407—Plant Design—3 cr. (1 and 6)
The application of the fundamentals of ceramic engineering to problems in plant design. *Prerequisite:* Senior standing in Ceramic Engineering.

CrE 410—Analytical Processes—3 cr. (2 and 3)
An introductory course on the theory and use of X-ray diffraction and spectroscopic methods. *Prerequisite:* Junior standing.

CrE 412—Raw Material Preparation—3 cr. (3 and 0)
The equipment and processes used in the crushing and grinding of raw materials, the separation and classification of particle sizes, and the separation and purification of minerals by mineral dressing methods.

CrE 416—Electronic Ceramics—3 cr. (3 and 0)
The theory and measurement of the electronic properties of ceramic products.

CrE 418—Process Control—3 cr. (3 and 0)
Process control techniques and apparatus with particular emphasis on temperature measurement and control systems. The application of laboratory techniques to the control of product quality and process efficiency is included. *Prerequisite:* Junior standing.

CrE 419—Science of Engineering Materials—3 cr. (3 and 0)
This course is planned to acquaint engineers with the thermal, electrical, and chemical characteristics of engineering materials. It emphasizes fundamental consideration of the structure of matter in the solid and glassy states, solid state reactions, and the influence of particle and aggregate structure to speed of reaction and product properties. The reasons for the properties of materials at elevated temperatures and room temperatures are related to these fundamentals.

CrE H419—Science of Engineering Materials—3 cr. (3 and 0)
Same as CrE 419 except that this honors section is open to students only by invitation.

CrE 420—Science of Engineering Materials—3 cr. (3 and 0)
A continuation of CrE 419 with emphasis on applications of fundamentals in nuclear reactors and nuclear power plants. Consideration is given to the development of ceramics for fuel elements, moderator materials, control rods, shielding and in radioactive waste disposal.

CrE 702—Solid State Ceramics—3 cr. (3 and 0)

CrE 703—Glasses—3 cr. (3 and 0)

CrE 704—Ceramic Coatings—3 cr. (3 and 0)

CrE 710—Analytical Processes—3 cr. (2 and 3)

CrE 712—Raw Material Preparation—3 cr. (3 and 0)

CrE 716—Electronic Ceramics—3 cr. (3 and 0)

CrE 718—Process Control—3 cr. (3 and 0)

CrE 719—Science of Engineering Materials—3 cr. (3 and 0)

CrE 720—Science of Engineering Materials—3 cr. (3 and 0)

CrE 807—Specialized Ceramics—3 cr. (3 and 0)

CrE 809—High-Temperature Materials—3 cr. (3 and 0)

CrE 810—Ceramic Engineering Thermodynamics—3 cr. (3 and 0)

CrE 811—Ceramic Engineering Kinetics—3 cr. (3 and 0)

CrE 812—Current Topics in Ceramic Engineering—1 cr. (1 and 0)

CrE 813—Nuclear Ceramics—3 cr. (3 and 0)

CrE 814—Ceramic Physical Processing—3 cr. (3 and 0)

CrE 815—Colloidal and Surface Science—3 cr. (3 and 0)

CrE 816—Constitution and Structure of Glasses—3 cr. (3 and 0)

CrE 821—Analytical Procedures and Equipment I—3 cr. (2 and 3)

CrE 822—Analytical Procedures and Equipment II—3 cr. (2 and 3)

CrE 823—Thermal Properties of Ceramic Materials—3 cr. (3 and 0)

CrE 824—Mechanical Properties of Ceramic Materials—3 cr. (3 and 0)

CrE 825—Magnetic and Electrical Ceramic Material—3 cr. 3 and 0)

CrE 826—Ceramic Coatings—3 cr. (3 and 0)

CrE 828—Solid State Ceramic Science—3 cr. (3 and 0)

CrE 891—Research—Credit to be arranged.

CHEMICAL ENGINEERING

Professors: C. E. Littlejohn, *Head;* F. C. Alley, R. C. Harshman

Associate Professors: W. B. Barlage, W. F. Beckwith, D. F. Bruley, J. W. Hall, J. C. Mullins

Assistant Professor: S. S. Melsheimer

ChE 204—Introduction to Chemical Engineering I—2 cr. (1 and 3)
Designed to acquaint students with the profession of Chemical Engineering and to introduce them to certain basic concepts and methods used by the chemical engineer. Topics include the chemical engineering literature, graphical methods of presenting data, graphical solutions to problems, fundamental units and dimensions, process variables, stoichiometry, and PVT relations for gases. *Prerequisite:* Ch 102 and Math 205.

ChE 205—Introduction to Chemical Engineering II—3 cr. (2 and 3)
A continuation of ChE 204. Topics include properties of mixtures of gases and vapors, material and energy balances, equilibria in chemical systems, dimensional analysis, economic considerations, and an introduction to stagewise calculations involving solvent extraction. *Prerequisite:* ChE 204.

ChE 210—Digital Computation and Numerical Methods—3 cr. (3 and 0)
An introduction to digital computational techniques using a specific procedure oriented language and the use of numerical methods for the solution of chemical engineering problems. The course will introduce students to computational methods to be used in subsequent chemical engineering courses. *Prerequisite:* ChE 204 and Math 205.

ChE 301—Unit Operations Theory I—3 cr. (3 and 0)
The general principles of Chemical Engineering and a study of the following unit operations: Fluid Flow, Fluid Transportation, Heat Transmission and Evaporation. Special emphasis is placed on theory and its practical application to design. *Prerequisite:* ChE 205, and Junior standing.

ChE 302—Unit Operations Theory II—3 cr. (3 and 0)
A study of selected unit operations based on diffusion. Both stagewise and differential contacts are studied for gas absorption, distillation, and gas-liquid contact operations. *Prerequisite:* ChE 301 and Junior standing.

ChE 306—Unit Operations Laboratory I—1 cr. (0 and 3)
Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is laid on the relation between theory and experimental results and on report writing. *Prerequisite:* ChE 301 and Junior standing.

ChE 307—Analog Computation—1 cr. (0 and 3)
An introduction to the theory and application of electronic analog computers. *Prerequisite:* Math 208.

ChE 331—Chemical Engineering Thermodynamics I—3 cr. (3 and 0)
A first basic course in static equilibria. Topics include the First and Second Law of Thermodynamics, real and ideal gases, thermodynamic properties of fluids, phase changes, and heats of reaction. *Prerequisite:* Ch 331, Math 208, and Junior standing; or permission of the Department Head.

ChE H331—Chemical Engineering Thermodynamics—3 cr. (3 and 0)
Honors section of ChE 301; admission by invitation.

ChE 401—Transport Phenomena—3 cr. (3 and 0)
Heat, mass, and momentum transport with emphasis being laid on how the three processes are related. A firmer theoretical foundation is laid for the previous work in unit operations. *Prerequisite:* ChE 302 and Senior standing.

ChE H401—Transport Phenomena—3 cr. (3 and 0)
Honors section of ChE 401; admission by invitation.

ChE 407—Unit Operations Laboratory II—2 cr. (0 and 6)
Laboratory work for the diffusional unit operations. Competent technical reports are required. *Prerequisite:* Enrollment in ChE 401 and Senior standing.

ChE 410—Unit Operations Theory III—3 cr. (3 and 0)
A study of simultaneous heat and mass transfer, filtration, crystallization, size reduction, and other less common unit operations.

ChE 415—Introduction to Nuclear Engineering—3 cr. (3 and 0)
Designed to acquaint the non-nuclear engineer with some of the engineering aspects of nuclear science. Topics include a brief survey of particle physics; nuclear reactions; energy transformations; nuclear reactors, their design, construction and use; radiation damage to materials of construction; and special problems in nuclear engineering peculiar to the basic engineering disciplines. *Prerequisite:* Junior or Senior standing in Engineering, Chemistry or Physics.

ChE 416—Introduction to Nuclear Engineering—3 cr. (3 and 0)
A continuation of ChE 415; topics to include reactor principles, plutonium production, reactor types, materials of reactor construction, control instruments, and waste disposal. *Prerequisite:* ChE 415.

ChE 421—Process Development, Design, and Optimization of Chemical Engineering Systems I—3 cr. (2 and 3)

A study of the steps in creating a chemical process design from the original concept to successful completion and operation of the plant. Topics include engineering economics, systems analysis, simulation, optimization, process equipment sizing and selection, and the application of analog and digital computers. *Prerequisite:* Completion of all required 200- and 300-level courses in chemistry, chemical engineering, and mathematics.

ChE 422—Process Development, Design, and Optimization of Chemical Engineering Systems II—3 cr. (0 and 9)

A continuation of ChE 421. The principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. *Prerequisite:* ChE 401, 421, 430, and 450.

ChE 423—Theory of Bio-Oxidation Processes—2 cr. (2 and 0)

Designed to cover the basic biochemical principles underlying bio-oxidation and their applications in activated sludge and trickling filter processes; basic theory of oxygen transfer and its application to the design of aeration equipment; and the design and operation of typical industrial waste treatment processes. *Prerequisite:* Ch 331 or permission of instructor.

ChE 424—Introduction to Industrial Pollution—2 cr. (2 and 0)

An introduction to air and water pollution problems associated with chemical processing transportation, and power generation. Basic processes and mechanisms utilized in the control of liquid and gaseous wastes are discussed from a standpoint of equipment design and economics. Present and future trends in pollution legislation are reviewed. *Prerequisite:* Senior standing in chemical engineering, or permission of instructor.

ChE 425—Chemical Process Engineering—3 cr. (3 and 0)

An advanced treatment of chemical engineering unit operations and unit processes. The course is designed to give the undergraduate more depth in these areas. *Prerequisite:* Permission of the instructor.

ChE 430—Chemical Engineering Thermodynamics II—3 cr. (3 and 0)

A continuation of ChE 331. Subjects include heat engines, compressors, refrigeration, phase equilibria and chemical reaction equilibria. *Prerequisite:* ChE 331 and Senior standing.

ChE 440—Senior Inspection Trip—0 cr.

A three- or four-day trip is made to visit selected chemical plants. Using lectures by plant personnel supplemented by conducted tours of chemical plant installations, the student is introduced to current industrial practice. *Prerequisite:* Senior standing in Chemical Engineering.

ChE 450—Chemical Engineering Kinetics—3 cr. (3 and 0)

An introduction to the kinetics of chemical reactions. Topics include homogeneous and heterogeneous reactions, batch and flow reaction systems, catalysis, and design of industrial reactors. *Prerequisite:* ChE 430 or permission of the Department Head.

ChE 452—Molecular and Turbulent Transport—3 cr. (3 and 0)
A theoretical treatment of the fundamental mechanisms of molecular and turbulent heat, mass, and momentum transport with the major emphasis given to the interrelation of all three mechanisms. Evaluation and correlation of transport properties and both steady state and unsteady state processes are considered. An elective course for non-chemical engineering students. *Prerequisite:* Senior standing in Chemistry, Engineering, or Physics, and Math 208.

ChE 453—Process Dynamics—3 cr. (3 and 0)
Basic process control and the effect of feedback in various systems. The mathematical analysis of the dynamic response of process systems to step and sinusoidal changes. Determination of the optimum settings for various combinations of proportional, reset and derivative control. *Prerequisite:* Junior or Senior standing in Engineering, Physics, or Chemistry, and Math 309 or permission of department head.

ChE 491—Special Projects in Chemical Engineering—1-3 cr. (1-3 and 0)
As a need arises, special topics requested by students or offered by the faculty will be taught. Review of current research in an area, technological advances and national engineering goals are possible topic areas.

ChE H491—Special Projects in Chemical Engineering—1-3 cr. (1-3 and 0)
Honors Section of ChE 491; admission by invitation.

ChE 701—Transport Phenomena—3 cr. (3 and 0)

ChE 707—Unit Operations Laboratory II—2 cr. (0 and 6)

ChE 715—Introduction to Nuclear Engineering I—3 cr. (3 and 0)

ChE 716—Introduction to Nuclear Engineering II—3 cr. (3 and 0)

ChE 723—Theory of Bio-Oxidation Processes—2 cr. (2 and 0)

ChE 730—Chemical Engineering Thermodynamics II—3 cr. (3 and 0)

ChE 750—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 752—Molecular and Turbulent Transport—3 cr. (3 and 0)

ChE 802—Process Dynamics and Control—3 cr. (3 and 0)

ChE 803—Heat, Mass, and Momentum Transfer—3 cr. (3 and 0)

ChE 804—Chemical Engineering Thermodynamics—3 cr. (3 and 0)

ChE 805—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 806—Chemical Engineering Calculations I—3 cr. (3 and 0)

ChE 807—Chemical Engineering Calculations II—3 cr. (3 and 0)

ChE 808—Chemical Engineering Design and Analysis—3 cr. (1 and 6)

ChE 809—Waste Treatment—3 cr. (3 and 0)

ChE 810—Biochemical Engineering—3 cr. (3 and 0)

ChE 820—Fluid Mechanics—3 cr. (3 and 0)

ChE 821—Heat Transport—3 cr. (3 and 0)

ChE 822—Mass Transfer and Differential Contact Operations—3 cr. (3 and 0)

ChE 823—Mass Transfer and Stagewise Contact Operations—3 cr. (3 and 0)

ChE 830—Chemical Technology—3 cr. (3 and 0)

ChE 840—Graduate Laboratory—Credit to be arranged.

ChE 845—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 846—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 847—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 852—Air Pollution Control Processes—3 cr. (3 and 0)

ChE 853—Industrial Air Hygiene—3 cr. (3 and 0)

ChE 854—Environmental Instrumentation and Measurements—3 cr. (2 and 3)

ChE 891—Research—Credit to be arranged.

ChE 902—Process Dynamics and Control—3 cr. (3 and 0)

ChE 903—Transport Phenomena—3 cr. (3 and 0)

ChE 904—Chemical Engineering Thermodynamics—3 cr. (3 and 0)

ChE 905—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 945—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 946—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 947—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 954—Environmental Systems Design—3 cr. (3 and 0)

ChE 991—Doctoral Research—Credit to be arranged.

CHEMISTRY

Professors: J. H. Hobson, J. W. Huffman, F. J. Lindstrom, A. R. Pinder, H. T. Polk, H. G. Spencer, *Head*

Associate Professors: J. F. Allen, C. B. Bishop, F. B. Brown, J. C. Fanning, N. P. Marullo,* J. R. Salley, Jr., G. B. Savitsky, J. L. von Rosenberg, Jr.

Assistant Professors: J. R. Bacon, R. H. Bailey, Jr., A. L. Beyerlein, Muriel B. Bishop, J. F. Geldard, O. J. Jacobus, K. S. Landers, G. L. Powell

Ch 101—General Chemistry—4 cr. (3 and 3)
Gives the student a general knowledge of the fundamentals of the science of chemistry through lectures, lecture experiments, and laboratory exercises. Consideration is given to the common substances.

Ch 102—General Chemistry—4 cr. (3 and 3)
A continuation of Ch 101.

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* On leave.

Ch H102—General Chemistry—4 cr. (3 and 3)
Same as Ch 102 except that this honors section is open to students by invitation only.

Ch 219—Chemical Principles—2 cr. (2 and 0)
The fundamental laws and theories pertaining to water and its solutions. The nature of chemical equilibria present in aqueous solutions is emphasized. *Prerequisite:* Ch 101 and 102.

Ch 220—Elementary Organic Chemistry—4 cr. (3 and 3)
A one semester course in organic chemistry. Typical classes of organic compounds, both aliphatic and aromatic, are studied. *Prerequisite:* Ch 101 and 102.

Ch 223—Organic Chemistry—3 cr. (3 and 0)
An introductory course covering the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. *Prerequisite:* Ch 101 and 102.

Ch 224—Organic Chemistry—3 cr. (3 and 0)
A continuation of Ch 223.

Ch 225—Organic Chemistry Laboratory—2 cr. (0 and 6)
The laboratory techniques involved in the synthesis, separation and purification, and characterization of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

Ch 226—Organic Chemistry Laboratory—2 cr. (0 and 6)
A continuation of Ch 225. *Prerequisite:* Registration in Ch 224.

Ch 227—Organic Chemistry Laboratory—1 cr. (0 and 3)
The synthesis and properties of typical examples of the classes of organic compounds. *Prerequisite:* Regulation in Ch 223.

Ch 228—Organic Chemistry Laboratory—1 cr. (0 and 3)
A continuation of Ch 227. *Prerequisite:* Registration in Ch 224.

Ch 310—Elementary Biochemistry—4 cr. (3 and 3)
An introductory course consisting of a review of equilibrium reactions; a study of the chemistry of carbohydrates, proteins, and lipids, and their role in cell metabolism. The laboratory work parallels classroom study. *Prerequisite:* Organic Chemistry.

Ch 313—Quantitative Analysis—3 cr. (3 and 0)
The fundamental principles of volumetric, gravimetric and certain elementary instrumental chemical analyses. *Prerequisite:* Organic Chemistry.

Ch 315—Quantitative Analysis Laboratory—2 cr. (0 and 6)
The laboratory techniques of volumetric, gravimetric, and elementary instrumental analysis.

Ch 317—Quantitative Analysis Laboratory—1 cr. (0 and 3)
The standard techniques of analytical chemistry—gravimetric, volumetric, and instrumental.

Ch 331—Physical Chemistry—3 cr. (3 and 0)
Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. *Prerequisite:* Math 206 and Physics.

CH 332—PHYSICAL CHEMISTRY—3 cr. (3 and 0)
Continuation of Ch 331 including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces.

CH 333—PHYSICAL CHEMISTRY LABORATORY—2 cr. (0 and 6)
Experiments designed to illustrate the physical chemistry theory studied in Ch 331. *Prerequisite:* Registration in Ch 331.

CH 334—PHYSICAL CHEMISTRY LABORATORY—2 cr. (0 and 6)
A continuation of Ch 333. *Prerequisite:* Registration in Ch 332.

CH 339—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)
Experiments are selected to be of maximum value to Chemical Engineering majors. *Prerequisite:* Registration in Ch 331.

CH 340—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)
A continuation of Ch 339. *Prerequisite:* Registration in Ch 332.

CH 402—INORGANIC CHEMISTRY—3 cr. (3 and 0)
A comprehensive survey of the field of inorganic chemistry through lectures and lecture experiments. Development of modern theories of atomic structure and valence, and a detailed study of the elements and their compounds, based on the periodic system and including both well-known and rarer elements. *Prerequisite:* Ch 331 and 332.

CH 411—INSTRUMENTAL ANALYSIS—4 cr. (2 and 6)
Demonstration and operation of modern optical and electronic precision measuring devices as they apply to the processes and analytical, physical and organic chemistry. *Prerequisite:* Physical Chemistry.

CH 421—ADVANCED ORGANIC CHEMISTRY—3 cr. (3 and 0)
A survey of modern methods of organic synthesis, with an emphasis on the principles involved. Application of spectroscopy in organic chemistry. *Prerequisite:* Ch 224 and 332 or equivalent.

CH 422—ADVANCED ORGANIC CHEMISTRY LABORATORY—2 cr. (0 and 6)
Modern laboratory techniques are used in the synthesis and identification of organic compounds. *Prerequisite:* Registration in Ch 421.

CH 423—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)
The study of the organic chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines and associated compounds leads to a fuller understanding of the chemical properties of proteins, carbohydrates, lipids, and nucleic acids that make them so important in biological processes. Relationships between the structure and function of these molecules and the modern techniques used to establish them are stressed. *Prerequisite:* Ch 224 or equivalent.

CH 424—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)
A continuation of Ch 423.

CH 425—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)
Experiments selected to illustrate current methods used in biochemical research.

CH 426—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)
A continuation of Ch 425.

Ch 431—Atomic and Molecular Structure—3 cr. (3 and 0)

An introductory study of the principles of wave mechanics, hydrogen atom structure, approximate methods, molecular orbital and valence bond treatments of bonding, hybridization, ligand-field theory, and relationships of structure to physical and chemical properties.

Ch 433—Physical Chemistry Laboratory—1 cr. (0 and 3)

To be taken in conjunction with Ch 431. Laboratory work in spectroscopy and other related areas of atomic and molecular structure will acquaint the student with some of the instruments currently used in the elucidation of structure.

Ch 441—Glass Manipulation—2 cr. (0 and 6)

A course designed to teach the fundamentals of glass manipulation and its application to the construction and repair of simple laboratory apparatus. *Prerequisite:* Senior standing.

Ch 442—Chemical Literature—1 cr. (1 and 0)

This course is designed to give the student practice in the use of chemical literature, the writing of technical reports and the presentation of same before the faculty of the Department of Chemistry. *Prerequisite:* Junior standing in Chemistry.

Ch 443—Research Problems—3 cr. (0 and 9)

Original investigation of an assigned problem in a fundamental branch of Chemistry. This work must be carried out under the supervision of a member of the staff. *Prerequisite:* Senior standing in Chemistry.

Ch 444—Research Problems—3 cr. (0 and 9)

A continuation of Ch 443.

Ch 450—Review of General Chemistry I—3 cr. (3 and 0)

A lecture course designed to deal with the basic principles generally presented in a general chemistry course. Emphasis will be placed upon the explanation of observed facts in terms of modern atomic and molecular structure. Enrollment limited to secondary school teachers.

Ch 454—Inorganic Synthesis—2 cr. (0 and 6)

A laboratory course designed to acquaint the student with various methods and techniques employed in the preparation and handling of inorganic compounds.

Ch 472—Organic Synthesis—4 cr. (2 and 6)

A course designed to teach the student techniques and principles as applied in a research laboratory. Both macro and semi-macro methods are used in the preparation of several organic compounds. *Prerequisite:* Organic Chemistry.

Ch 491—Introduction to Radiochemistry—3 cr. (2 and 3)

The natural and synthetic radioisotopes, including the consideration of atomic and nuclear structure, properties of radiation and tracer techniques and their application. The laboratory is concerned with the methods of detection and measurement of the various types of radiation and the various applications of tracer techniques. *Prerequisite:* Senior or Graduate standing and permission of instructor.

Ch 613—Quantitative Analysis—3 cr. (3 and 0)

CH 615—QUANTITATIVE ANALYSIS LABORATORY—2 cr. (0 and 6)

CH 617—QUANTITATIVE ANALYSIS LABORATORY—1 cr. (0 and 3)

CH 631—PHYSICAL CHEMISTRY—3 cr. (3 and 0)

CH 632—PHYSICAL CHEMISTRY—3 cr. (3 and 0)

CH 639—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 640—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 702—INORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 711—INSTRUMENTAL ANALYSIS—4 cr. (2 and 6)

CH 721—ADVANCED ORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 722—ADVANCED ORGANIC CHEMISTRY LABORATORY—2 cr. (0 and 6)

CH 723—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)

CH 724—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)

CH 725—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 726—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 731—ATOMIC AND MOLECULAR STRUCTURE—3 cr. (3 and 0)

CH 733—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 750—REVIEW OF GENERAL CHEMISTRY I—3 cr. (3 and 0)

CH 754—INORGANIC SYNTHESIS—2 cr. (0 and 6)

CH 772—ORGANIC SYNTHESIS—4 cr. (2 and 6)

CH 791—INTRODUCTION TO RADIOCHEMISTRY—3 cr. (2 and 3)

CH 800T—PHYSICAL SCIENCE FOR THE HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

CH 805—THEORETICAL INORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 806—SPECIAL TOPICS IN INORGANIC CHEMISTRY—1 to 4 cr.

CH 807—CHEMISTRY OF THE TRANSITION ELEMENTS—3 cr. (3 and 0)

CH 808—CHEMISTRY OF THE NON-METALLIC ELEMENTS—3 cr. (3 and 0)

CH 814—ELECTROANALYTICAL CHEMISTRY—3 cr. (2 and 3)

CH 811—ANALYTICAL CHEMISTRY—3 cr. (3 and 0)

CH 812—CHEMICAL SPECTROSCOPIC METHODS—3 cr. (2 and 3)

CH 821—ORGANIC CHEMISTRY I—3 cr. (3 and 0)

CH 822—ORGANIC CHEMISTRY II—3 cr. (3 and 0)

CH 823—ORGANIC REACTION MECHANISMS—3 cr. (3 and 0)

CH 824—FUNDAMENTAL PRINCIPLES OF POLYMER CHEMISTRY—3 cr. (3 and 0)

CH 825—CURRENT TOPICS IN ORGANIC CHEMISTRY—1 cr. (1 and 0)

CH 826—CHEMISTRY OF ENZYMES—3 cr. (3 and 0)

CH 829—CHEMISTRY AND METABOLISM OF CARBOHYDRATES—2 cr. (2 and 0)

CH 831—CHEMICAL THERMODYNAMICS—3 cr. (3 and 0)

CH 832—STATES OF MATTER—3 cr. (3 and 0)

CH 834—STATISTICAL THERMODYNAMICS—3 cr. (3 and 0)

CH 835—CHEMICAL KINETICS—3 cr. (3 and 0)

CH 836—TOPICS IN COLLOID SCIENCE—3 cr. (3 and 0)

CH 837—QUANTUM CHEMISTRY—3 cr. (3 and 0)

CH 841—MATHEMATICAL ASPECTS OF CHEMICAL SPECTROSCOPY—3 cr. (3 and 0)

CH 850—A REVIEW OF GENERAL CHEMISTRY II—3 cr. (2 and 3)

CH 851—CHEMISTRY SEMINAR—0 to 2 cr.

CH 891—RESEARCH—Credit to be arranged.

CH 921—HETEROCYCLIC COMPOUNDS—3 cr. (3 and 0)

CH 922—STEREOCHEMISTRY—3 cr. (3 and 0)

CH 923—CHEMISTRY OF NATURAL PRODUCTS—3 cr. (3 and 0)

CH 924—CHEMISTRY OF NATURAL PRODUCTS—3 cr. (3 and 0)

CH 930—ADVANCED TOPICS IN PHYSICAL CHEMISTRY—3 cr. (3 and 0)

CH 950—MICROANALYTICAL TECHNIQUES—3 cr. (1 and 6)

CH 991—DOCTORAL RESEARCH—Credit to be arranged.

CITY AND REGIONAL PLANNING

Professor: E. L. FALK

Lecturer: S. CARTER

Visiting Associate Professor: R. D. BRAY

CRP 411—INTRODUCTION TO CITY AND REGIONAL PLANNING—3 cr. (3 and 0)
Overview of urban land-use planning. Analysis of current work in each significant phase of planning. Discussion of good formulation, foundation studies, land-use planning methods and consideration and continuing evaluation and modification of an urban-planning process.

CRP 412—CITY AND REGIONAL PLANNING THEORY—3 cr. (3 and 0)
The philosophical, methodological, and ethical aspects of planning will be explored through selected readings, student reports, lectures and discussion. A critical examination of current planning theories.

CRP 421—URBAN SOCIAL STRUCTURE—3 cr. (3 and 0)
The social, economic, and political aspects of communities of varying sizes and types. Elements will include housing, education, recreation, social services, governmental structure, and related community institutions.

CRP 441—HISTORY OF PLANNING—3 cr. (3 and 0)
Offered first semester only. The development of the urban plan from ancient to modern times.

CRP 453—INTRODUCTION TO PLANNING STUDIO—5 cr. (5 and 0)
New town site selection, preparation of goals and objectives, foundation studies and forecasts, and development of generalized land use and trans-

portation plan. Students will gain experience in project coordination and interdepartmental and governmental agency cooperation.

CRP 454—PLANNING STUDIO II—5 cr. (5 and 0)
Studies involving small or medium-sized cities. These will include evaluation of community goals and objectives, appropriate foundation surveys and projections, and development of generalized land-use alternatives. Work with available land-use data, professionals involved in the planning function, and development of a generalized land-use plan, reflective and responsive to community and official needs.

CRP 472—PLANNING ADMINISTRATION AND PRACTICE—3 cr. (3 and 0)
The organization and administration of types of planning agencies and their relationship to other governmental and private organizations.

CRP 473—GOVERNMENT AND PLANNING LAW—3 cr. (3 and 0)
A complete coverage of the laws and ordinances relating to redevelopment, subdivision control, zoning, official mapping, and other topics including interpretation, philosophy, enabling legislation, and model ordinances. The legal basis of current and long-range planning policy will be discussed. *Prerequisite:* CRP 472 (Planning Administration and Practice).

CRP 483—SEMINAR ON PLANNING COMMUNICATION—3 cr. (3 and 0)
Informal means open for plan implementation. The organization of effective public information and education programs, use of citizens' advisory committees, and application of other implementation techniques. Lectures, student reports, selected readings, and visiting speakers.

CRP 711—INTRODUCTION TO CITY AND REGIONAL PLANNING—3 cr. (3 and 0)

CRP 712—CITY AND REGIONAL PLANNING THEORY—3 cr. (3 and 0)

CRP 721—URBAN SOCIAL STRUCTURE—3 cr. (3 and 0)

CRP 741—HISTORY OF PLANNING—3 cr. (3 and 0)

CRP 753—INTRODUCTION TO PLANNING STUDIO—5 cr. (5 and 0)

CRP 754—PLANNING STUDIO II—5 cr. (5 and 0)

CRP 772—PLANNING ADMINISTRATION AND PRACTICE—3 cr. (3 and 0)

CRP 773—GOVERNMENT AND PLANNING LAW—3 cr. (3 and 0)

CRP 783—SEMINAR ON PLANNING COMMUNICATION—3 cr. (3 and 0)

CRP 822—URBAN SYSTEMS—3 cr. (3 and 0)

CRP 831—ECONOMICS OF LAND USE PLANNING—3 cr. (3 and 0)

CRP 863—PLANNING STUDIO III—5 cr. (2 and 9)

CRP 864—PLANNING THESIS—9 cr. (0 and 27)

CRP 881—SEMINAR IN QUANTITATIVE METHODS I—3 cr. (3 and 0)

CRP 882—SEMINAR IN QUANTITATIVE METHODS II—3 cr. (3 and 0)

CRP 884—PUBLIC FACILITY PLANNING—3 cr. (3 and 0)

CRP 893—CITY AND REGIONAL PLANNING INTERNSHIP—3 cr. (0 and 0)

CRP 894—CITY AND REGIONAL PLANNING INTERNSHIP—3 cr. (0 and 0)

CIVIL ENGINEERING

Professors: L. G. Rich, I. A. Trively

Associate Professors: H. W. Busching, *Head;* R. E. Elling, J. M. Ford, J. C. McCormac, A. J. McCutchen, J. P. Rostron, A. E. Schwartz

Assistant Professors: D. B. Stafford, W. A. Welsh, Jr., F. L. Roberts

Instructor: R. A. Coleman

CE 201—Surveying—3 cr. (2 and 3)

Elementary plane surveying for other than Civil Engineering students. Coverage includes measurement of distance, leveling, horizontal and vertical angles, stadia and topography, area and volume calculations, construction surveying. Field exercises provide practice in the use of surveying instruments. *Prerequisite:* Math 106.

CE 205—Civil Engineering Methology—2 cr. (1 and 3)

Concepts of civil engineering analysis and design, case histories and project studies, introduction to theory and practice of plane surveying, measurements and errors, differential leveling, and topographic mapping. Laboratory includes typical design and construction problems. *Prerequisite:* Math 106.

CE 206—Geometrics—2 cr. (1 and 3)

Application of geometrics to civil engineering problems, computations and triangulation, coordinate systems, electronic methods of measuring distances, photogrammetry, introduction to digital computation and elementary programming. *Prerequisite:* CE 205.

CE 301—Introduction to Structural Science—3 cr. (2 and 2)

Analysis of statically determinate and indeterminate structural elements and systems. Influence lines for beams and trusses, calculation of rotations and deflections by integration, moment area, conjugate beam and unit load methods. Indeterminate analysis by force and displacement methods and moment distribution. *Prerequisite:* EM 304, CE 206.

CE 302—Structural Design I—3 cr. (2 and 2)

Design and detail of components and connections for timber and metal structures. *Prerequisite:* CE 301.

CE 310—Transportation Engineering—4 cr. (3 and 2)

Planning, location, design, operation, and administration of highways, railroads, airports and other transportation facilities, including economic considerations, pavement design, and digital computer applications to geometric and earthwork computation. *Prerequisite:* CE 206; *corequisite:* CE 331.

CE 320—Concrete and Bituminous Materials—2 cr. (1 and 3)

Investigation and selection of aggregates for portland cement concrete and asphaltic concrete; latest methods of design of portland cement mixes and asphaltic concrete mixes; field control and adjustments; field trips to nearby construction jobs. *Prerequisite:* EM 304 and Junior standing.

CE 331—Soil Mechanics—3 cr. (2 and 2)

Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength, consolidation, stress distribution and bearing capacity of soils. *Prerequisite:* EM 304 and Junior standing.

CE 341—ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)
An evaluation of the effects of the environment on man with special consideration given to air and water contacts. The analysis and review of engineering systems used in environmental control. *Prerequisite or Concurrent:* EM 320, EM 322.

CE 399—SIMULATION TECHNIQUES—1 cr. (0 and 3)
Modeling of civil engineering problems with the electronic analog computer, with conductive sheet methods and by digest analog simulation. The emphasis is in use rather than the theory of the methods. *Prerequisite:* Math 208.

CE 402—STRUCTURAL DESIGN II—3 cr. (2 and 2)
Design and detail of reinforced concrete members using elastic and ultimate strength theories, introduction to prestressed concrete. *Prerequisite:* CE 301, CE 320.

CE 410—TRAFFIC ENGINEERING: OPERATIONS—3 cr. (3 and 0)
Basic characteristics of motor-vehicle traffic; techniques for making traffic engineering investigations; design and application of traffic control devices; traffic design of parking facilities; traffic laws and ordinances; public relations. *Prerequisite:* CE 310.

CE 412—URBAN TRANSPORTATAON PLANNING—3 cr. (3 and 0) F
Urban travel characteristics; characteristics of transportation systems; transportation and land-use studies; trip distribution and trip assignment models; city patterns and subdivision layout. *Prerequisite:* CE 311.

CE 415—SEMINAR IN TRAFFIC ENGINEERING—1 cr. (0 and 2)
Discussion, readings, and practical applications of the operational methods of traffic engineering and consideration of the problems confronting the city, county, and state traffic engineer.

CE 417—AIRPHOTO INTERPRETATION I—3 cr. (2 and 3)
A brief review of the basic geometry of aerial photographs, characteristics of geologic and topographic features identifiable from aerial photographs, and site characteristics related to soil profile. Laboratory work includes soil mapping, selection of construction sites, and location of soil deposits for engineering purposes. *Prerequisite:* Junior standing and/or permission of instructor.

CE 419—GENERAL PHOTOGRAMMETRY—3 cr. (2 and 3) S
Fundamentals of mapping by the use of aerial photographs; characteristics, production and use of aerial photographs; study of the operation of popular photogrammetric instruments including aerial cameras, stereoscopic viewing and plotting equipment; practice in the use of stereocomparagraph and multiplex plotting instruments; scale, tilt, and coordinate calculations; construction of photomosaics. *Prerequisite:* Math 205 and Junior standing.

CE 420—MECHANICAL PROPERTIES OF MATERIALS—3 cr. (3 and 0)
The course provides a comprehensive introduction to the analysis of mechanical response of materials. Emphasis is placed on the behavior of solid materials that are used in civil engineering structures but are not considered in depth in other undergraduate courses. Plastics, fibers, and composite materials are studied. Students are assisted in investigating a realistic problem in materials technology. *Prerequisite:* Permission of instructor.

CE 424—Construction Methods—2 cr. (2 and 0)

A survey of the principal method and equipment used in the construction industry. *Prerequisite:* Senior standing.

CE 425—Engineering Relations—3 cr. (3 and 0)

Business, legal, and ethical relations in engineering practice. *Prerequisite:* Senior standing.

CE 431—Applied Soil Mechanics—3 cr. (2 and 2)

Relationship of local geology to soil formations, ground water, planning of site investigation, sampling procedures, laboratory determination of design parameter, foundation design and settlement analysis. *Prerequisite:* CE 331.

CE 434—Construction Costs and Estimates—3 cr. (2 and 2)

Interpretation of specifications and plan reading necessary for the proper estimation of quantities of materials and costs of engineering structures. The course is presented from both the designer's and the constructor's viewpoint in order to fit the young engineer with the essential details an inspector or a construction engineer should have at his command. *Prerequisite:* Senior standing.

CE 435—Engineering Project Analysis—3 cr. (2 and 2)

Advanced analysis of engineering projects. Theory of economic, financial and intangible analysis of large-scale construction projects. Practical exercises in cost-benefit studies and construction decisions. *Prerequisite:* Permission of instructor.

CE 441—Water Resources Engineering—3 cr. (2 and 3)

The hydrologic and economic considerations involved in the control and utilization of water; analysis and design of water and waste water collection systems and water distribution systems. *Prerequisite:* CE 341, EM 320, and EM 322.

CE 453—Advanced Structural Analysis—3 cr. (3 and 0)

Slopes and deflections of beams and trusses by energy methods. Analysis of statically indeterminate structures and construction of influence lines by virtual-work method. Application of moment distribution and slope deflection methods. *Prerequisite:* CE 301.

CE 490—Special Projects—1-3 cr. (1-3 and 0-0)

Studies or laboratory investigations on special topics in the Civil Engineering field which are of interest to individual students and staff members. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. *Prerequisite:* Senior standing.

CE H490—Special Projects—1-3 cr. (1-3 and 0)

Honors section of CE 490; admission by invitation.

CE 631—Introductory Soil Mechanics—3 cr. (2 and 2)

(Non-Civil Engineering students only.)

CE 699—Simulation Techniques—1 cr. (0 and 3)

CE 710—Traffic Engineering: Operations—3 cr. (3 and 0)

CE 712—Urban Transportation Planning—3 cr. (3 and 0)

CE 715—Seminar in Traffic Engineering—1 cr. (0 and 2)

CE 717—AIRPHOTO INTERPRETATION I—3 cr. (2 and 3)

CE 719—GENERAL PHOTOGRAMMETRY—3 cr. (2 and 3)

CE 720—MECHANICAL PROPERTIES OF MATERIALS—3 cr. (3 and 0)

CE 731—APPLIED SOIL MECHANICS—3 cr. (2 and 2)

CE 734—CONSTRUCTION COSTS AND ESTIMATES—3 cr. (2 and 3)

CE 735—ENGINEERING PROJECT ANALYSIS—3 cr. (2 and 2)

CE 753—ADVANCED STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 801—STRUCTURAL ENGINEERING I—3 cr. (3 and 0)

CE 802—PRESTRESSED CONCRETE ANALYSIS AND DESIGN—3 cr. (3 and 0)

CE 803—REINFORCED CONCRETE STRUCTURAL SYSTEMS—3 cr. (3 and 0)

CE 804—THEORY AND DESIGN OF THIN PLATES—3 cr. (3 and 0)

CE 805—PLASTIC DESIGN OF STEEL STRUCTURES—3 cr. (3 and 0)

CE 806—DESIGN OF STEEL MEMBERS—3 cr. (3 and 0)

CE 807—NUMERICAL AND APPROXIMATE METHODS OF STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 808—FINITE ELEMENT METHODS IN STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 811—TRAFFIC ENGINEERING: GEOMETRIC DESIGN—3 cr. (2 and 3)

CE 812—AIRPHOTO INTERPRETATION II—3 cr. (2 and 3)

CE 813—HIGHWAY AND AIRPORT PAVEMENT DESIGN—3 cr. (3 and 0)

CE 814—TRAFFIC FLOW THEORY—3 cr. (3 and 0)

CE 816—HIGHWAY PLANNING—3 cr. (3 and 0)

CE 819—HIGHWAY RESEARCH—2 to 4 cr.

CE 820—CEMENT AND CONCRETE—3 cr. (2 and 3)

CE 821—BITUMINOUS PAVING MATERIALS—3 cr. (2 and 3)

CE 822—AGGREGATES AS CONSTRUCTION MATERIALS—3 cr. (2 and 3)

CE 823—INELASTIC BEHAVIOR OF ENGINEERING MATERIALS—3 cr. (3 and 0)

CE 825—DISTRIBUTION AND PROPERTIES OF SOILS—3 cr. (3 and 0)

CE 831—FOUNDATION ENGINEERING—3 cr. (2 and 3)

CE 832—ADVANCED SOIL MECHANICS—3 cr. (3 and 0)

CE 833—PHYSICAL AND PHYSIO-CHEMICAL PROPERTIES OF SOILS—3 cr. (2 and 3)

CE 835—DESIGN OF EARTH STRUCTURES—3 cr. (3 and 0)

CE 889—SPECIAL PROBLEMS I—1-3 cr.

CE 890—SPECIAL PROBLEMS II—1-3 cr.

CE 891—RESEARCH—3 cr.

CE 901—THEORY AND DESIGN OF SHELLS—3 cr. (3 and 0)

CE 902—Structural Vibrations—3 cr. (3 and 0)

CE 991—Doctoral Research—Credit to be arranged.

COMPUTER SCIENCE

Professor: A. T. Hind, Jr.

Associate Professors: R. E. Haymond, C. E. Kirkwood, Jr., M. C. Palmer

Instructor: Eugenie V. Bartmess

Comp Sc 205—Computer Programming in PL/1—3 cr. (2 and 3)
A detailed study of the PL/1 programming language and its use in solving numerical problems. In addition to the basic language, a study is made of data, input-output and structures.

Comp Sc 210—Algorithmic Processes for Engineers—3 cr. (3 and 0)
Concept and properties of an algorithm, language and notations for describing algorithms, analysis of computational problems, development of algorithms, and applications to include polynomial interpolation, zeros of equations, systems of equations, matrix manipulations, and solution of differential equations.

Comp Sc 311—Computer Organization and Programming—3 cr. (3 and 0)
Logical basis of computer structure, machine representation of numbers and characters, flow of control, instruction codes, arithmetic and logical operations, indexing, input-output, subroutines, linkages, macros, interpretive and assembly systems, storage organization. *Prerequisite:* Comp Sc 205.

Comp Sc 409—Introduction to Numerical Analysis I—3 cr. (3 and 0)
An introduction to the problems of classical numerical analysis emphasizing computational procedures and application. Topics include: polynomial interpolation, matrix methods, systems of linear equations nonlinear equations, numerical solution of ordinary differential equations. *Prerequisite:* Comp Sc 205 or EE 299 and Math 208.

Comp Sc 410—Introduction to Numerical Analysis II—3 cr. (3 and 0)
A continuation of Comp Sc 409. Ordinary differential equations boundary value problems, functional approximation, numerical solution of partial differential equations.

Comp Sc 428—Algorithmic Languages and Compilers—3 cr. (3 and 0)
Formed description of algorithmic languages and the techniques used in their compilation, study of syntax, semantics, procedures, replication, iteration, and recursion in these languages, including comparisons of commonly used languages. *Prerequisite:* Comp Sc 205, Math 295 or equivalent.

Comp Sc 611—Computer Organization and Programming—3 cr. (3 and 0)

Comp Sc 709—Introduction to Numerical Analysis I—3 cr. (3 and 0)

Comp Sc 728—Algorithmic Languages and Compilers—3 cr. (3 and 0)

Comp Sc 863—Digital Models I—3 cr. (3 and 0)

Comp Sc 864—Digital Models II—3 cr. (3 and 0)

DAIRY SCIENCE

Professors: R. W. Henningson, V. Hurst, J. J. Janzen, W. A. King, *Head;* J. T. Lazar, Jr.

Associate Professors: C. C. Brannon, W. V. Chalupa, J. F. Dickey

Assistant Professor: G. D. O'Dell

Dy Sc 201—Introduction to Dairy Science—3 cr. (2 and 3) F, S

A fundamental course designed to give the student a working knowledge of Dairy Science. Studies include history of dairying, dairy breeds and cattle evaluation, nutrition, physiology, housing, quality milk production, quality control and the evaluation of milk and its products, the manufacture of milk products and their value in the human food supply.

Dy Sc 306—The Chemical and Physical Nature of Milk—3 cr. (2 and 3) S

The nature and properties of the major and minor constituents of milk, the effect of chemical and physical treatment on milk constituents, and analytical methods necessary to determine the composition and properties of milk and its constituents. The philosophy and development of quality control.

Dy Sc 307—Market Milk—3 cr. (2 and 3) F, '70 and alternate years.

Composition, procurement, processing, distribution, quality control, public health aspects, basic chemistry and bacteriology of industrial milk supplies and cultured products.

Dy Sc 310—Dairy Cattle Selection—1 cr. (0 and 3) F, '70 and alternate years.

Emphasis is placed upon the selection of dairy cattle for profitable herd operations. Evaluations of herd classifications, fitting, showing, and true type are made.

Dy Sc 402—Dairy Manufactures—4 cr. (3 and 3) S, '72 and alternate years.

The principles and practice of the manufacture of ice cream and related dairy products, the principles of the manufacturer of condensed and evaporated milks and milk powders, and the physical, chemical and biological factors involved.

Dy Sc 404—Plant Management—3 cr. (2 and 3) S, '71 and alternate years.

The organization and operation of dairy and food plants and the coordination of all functions into an orderly business enterprise. Emphasis will be given to management's responsibility concerning the procurement, processing, quality control and distribution of food products. Business and industrial techniques are used to develop maximum efficiencies.

Dy Sc 409—Dairy Science Seminar—2 cr. (2 and 0) F, '71 and alternate years.

Special research problems in production and manufactures are studied. Individual topics not fully covered in class work are assigned for special report before class and members of Dairy Science Staff.

Dy Sc 410—Dairy Science Seminar—2 cr. (2 and 0)
S, '72 and alternate years.
A continuation of Dy Sc 409 with emphasis on current research literature and research methods.

Dy Sc 452—Dairy Cattle Feeding and Management—3 cr. (2 and 3)
S, '71 and alternate years.
Fundamental principles in the care, feeding, and management of dairy cattle of all ages. Topics include general consideration in selecting a breed and the individual cow, calf raising, growth and development of dairy heifers, care and management of the milking herd and feeding for milk production.

Dy Sc 453—Animal Reproduction—3 cr. (3 and 0) F
Reproductive physiology and endocrinology of mammals with emphasis on farm animals and frequent reference to reproduction in laboratory animals and humans.

Dy Sc 455—Animal Reproduction Laboratory—1 cr. (0 and 3) F
This course will supplement Dy Sc 453. Practical work will include comparative anatomy and histology of the male and female reproductive organs; semen collection, evaluation and processing; techniques of artificial insemmination, sexual behavior and the principles of pregnancy tests for humans. *Prerequisite:* To be taken concurrently or to follow Dy Sc 453.

Dy Sc 606—Chemical and Physical Nature of Milk—3 cr. (2 and 3)

Dy Sc 607—Market Milk—3 cr. (2 and 3)

Dy Sc 702—Dairy Manufactures—4 cr. (3 and 3)

Dy Sc 704—Plant Management—3 cr. (2 and 3)

Dy Sc 752—Dairy Cattle Feeding and Management—3 cr. (2 and 3)

Dy Sc 753—Animal Reproduction—3 cr. (3 and 0)

Dy Sc 755—Animal Reproduction Laboratory—1 cr. (0 and 3)

Dy Sc 801—Topical Problems—1 to 3 cr.

Dy Sc 802—Genetics of Dairy Cattle Improvement—3 cr. (3 and 0)

Dy Sc 803—Physiology of Reproduction and Milk Secretion—3 cr. (3 and 0)

Dy Sc 804—Endocrinology—3 cr. (3 and 0)

Dy Sc 805—Newer Knowledge of Dairy Nutrition—3 cr. (3 and 0)

Dy Sc 807—Fermented Dairy Products—3 cr. (2 and 3)

Dy Sc 808—Industrial Dairy Science—3 cr. (3 and 0)

Dy Sc 809—Rumen Metabolism—3 cr. (2 and 3)

Dy Sc 891—Research—Credit to be arranged.

ECONOMICS

Professors: H. H. MACAULAY, JR., W. C. WHITTEN, JR.

Associate Professors: J. F. PEARCE, B. R. SKELTON, H. J. WHEELER, *Head*

Assistant Professors: F. A. CLOSE, R. D. SHANNON, H. H. ULBRICH,* T. B. YANDLE, JR., J. A. ZIEGLER

Instructors: L. E. NORDQUIST, D. E. SHULENBURGER, M. E. WHITEHEAD, A. G. WISE

ECON 201—PRINCIPLES OF ECONOMICS—3 cr. (3 and 0)

The fundamental principles of pricing, stablization and growth in a modern economy. Topics include supply and demand, employment theory and fiscal policy, the banking system and monetary policy, and the economics of growth.

ECON H201—PRINCIPLES OF ECONOMICS—3 cr. (3 and 0)

An enrichment of the subject matter of Econ 201 through assigned readings and individualized instruction; admission by invitation.

ECON 202—PRINCIPLES OF ECONOMICS—3 cr. (3 and 0)

Continuation of Econ 201 with an intensive study of the economics of the firm, the pricing of resources, and international economic relations. The theory is given relevance through the analysis of current economic problems. *Prerequisite:* Econ 201.

ECON H202—PRINCIPLES OF ECONOMICS—3 cr. (3 and 0)

An enrichment of the subject matter of Econ 202 through assigned readings and individualized instruction; admission by invitation. *Prerequisite:* Econ 201 or Econ H201.

ECON 301—ECONOMICS OF LABOR—3 cr. (3 and 0)

The economics of the labor market, the problems of the industrial worker, and the methods of adjusting labor-management disputes. *Prerequisite:* Econ 201.

ECON 302—MONEY AND BANKING—3 cr. (3 and 0)

Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. *Prerequisite:* Econ 201 and 202.

ECON 305—INVESTMENT ANALYSIS—3 cr. (3 and 0)

A study of techniques useful in analyzing alternative investment opportunities, with emphasis on corporate securities. Investment planning and portfolio management are considered. *Prerequisite:* Econ 201.

ECON 306—RISK AND INSURANCE—3 cr. (3 and 0)

Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints by considering insurance carriers, contracts, underwriting and regulation. *Prerequisite:* Econ 201.

ECON 308—COLLECTIVE BARGAINING—3 cr. (3 and 0)

The practices, procedures, legal foundations, and legal structure associated with collective bargaining. The form and content of the labor contract, the grievance machinery, and the mediation and arbitration institutions will also be studied. *Prerequisite:* Econ 201.

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* Part-time.

Econ 309—Government and Business—3 cr. (3 and 0)
The relationships between government and business, including among other topics, governmental efforts to enforce competition, to regulate public utilities, and to protect the special interests of laborers, farmers, and consumers. *Prerequisite:* Econ 201.

Econ 314—Intermediate Economic Theory—3 cr. (3 and 0)
An analytical study of the basic concepts of value and distribution under alternative market conditions. *Prerequisite:* Econ 201 and 202.

Econ 403—Development of Economic Thought—3 cr. (3 and 0)
A study of the origin and evolution of ideas with some emphasis on the historical context, the problems which inspired these ideas, and the nature of the solutions which they provided: from ancient days to the present. *Prerequisite:* Econ 201 and 202.

Econ 404—Comparative Economic Systems—3 cr. (3 and 0)
A comparative analytical and historical study of the principal economic systems which have been important in the modern world including among others, capitalism and socialism. *Prerequisite:* Econ 201 and 202.

Econ 407—National Income and Employment Analysis—3 cr. (3 and 0)
An intensive study of selected economic theories with special emphasis on income and employment. Part of the course is devoted to the analysis of national income accounts and income. *Prerequisite:* Econ 201 and 202.

Econ 410—Economic Development—3 cr. (3 and 0)
Consideration and analysis of economic and related problems of the underdeveloped countries. Attention will be given to national and international programs designed to accelerate solution of these problems. *Prerequisite:* Econ 201 and 202.

Econ 412—International Trade—3 cr. (3 and 0)
A study of economic principles particularly applicable to trade between nations. Topics covered include the balance of payments, determination of foreign exchange rates, price and income effects on the composition and level of trade, and commercial policy. *Prerequisite:* Econ 314.

Econ 413—International Finance—3 cr. (3 and 0)
With primary emphasis upon international monetary relations, the course surveys history and theory. Topics covered include exchange-rate determination, exchange-stability conditions, the purchasing-power-parity doctrine, the effects of devaluation and exchanging speculation. (Not open to students who have taken Econ 412.) *Prerequisite:* Econ 302.

Econ 416—Development of the Modern Economy—3 cr. (3 and 0)
An analysis of the historical forces and influences which have contributed to the emergence and development of the modern economy. *Prerequisite:* Econ 201 and 202.

Econ 420—Economics of Taxation—3 cr. (3 and 0)
An intensive study of a limited number of problems in taxation with particular emphasis on the economic effects that cause and result from certain taxes. Topics include averaging, incentives to work, incidence, concepts of equity, excess burden, definitions of income, depletion, and capital gains. *Prerequisite:* Econ 314.

ECON 421—URBAN ECONOMICS—3 cr. (3 and 0)
Economic problems associated with the concentration of population in central places are examined. The historical development of cities and the associated economic implications for individuals, firms, and society are studied. Legislation of economic importance to urban living is analyzed. *Prerequisite:* Econ 201 and 202.

ECON 422—MONETARY THEORY AND POLICY—3 cr. (3 and 0)
An intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. *Prerequisite:* Econ 302 or permission of the instructor.

ECON 424—THE ORGANIZATION OF INDUSTRIES—3 cr. (3 and 0)
Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output and other policies of the firm; antitrust and other public policies and problems will be studied. *Prerequisite:* Econ 314.

ECON 703—DEVELOPMENT OF ECONOMIC THOUGHT—3 cr. (3 and 0)

ECON 704—COMPARATIVE ECONOMIC SYSTEMS—3 cr. (3 and 0)

ECON 707—NATIONAL INCOME AND EMPLOYMENT ANALYSIS—3 cr. (3 and 0)

ECON 710—ECONOMIC DEVELOPMENT—3 cr. (3 and 0)

ECON 712—INTERNATIONAL TRADE—3 cr. (3 and 0)

ECON 713—INTERNATIONAL FINANCE—3 cr. (3 and 0)

ECON 716—DEVELOPMENT OF THE MODERN ECONOMY—3 cr. (3 and 0)

ECON 720—ECONOMICS OF TAXATION—3 cr. (3 and 0)

ECON 721—URBAN ECONOMICS—3 cr. (3 and 0)

ECON 722—MONETARY THEORY AND POLICY—3 cr. (3 and 0)

ECON 724—THE ORGANIZATION OF INDUSTRIES—3 cr. (3 and 0)

ECON 800—ADVANCED ECONOMIC ANALYSIS—3 cr. (3 and 0)

ECON 802—ADVANCED ECONOMIC CONCEPTS AND APPLICATIONS I—3 cr. (3 and 0)

ECON 803—ADVANCED ECONOMIC CONCEPTS AND APPLICATIONS II—3 cr. (3 and 0)

ECON 810—SEMINAR IN ECONOMIC ANALYSIS—3 cr. (3 and 0)

ECON 811—SEMINAR IN LABOR ECONOMICS—3 cr. (3 and 0)

ECON 812—SEMINAR IN THE DEVELOPMENT OF ECONOMIC THOUGHT—3 cr. (3 and 0)

ECON 813—SEMINAR IN COMMUNITY GOODS AND ENVIRONMENTAL QUALITY—3 cr. (3 and 0)

ECON 821—ECONOMIC THEORY I—3 cr. (3 and 0)

ECON 822—ECONOMIC THEORY II—3 cr. (3 and 0)

ECON 891—RESEARCH—Credit to be arranged.

ECON 900—SEMINAR IN ADVANCED ECONOMIC THEORY—3 cr. (3 and 0)

EDUCATION

Professors: L. H. Davis, M. A. King, *Head;* H. F. Landrith

Associate Professors: C. R. Freeze, G. W. Gray, M. A. Packer, W. W. Pennscott, R. E. Ware

Assistant Professors: L. L. Byrd, J. R. Harris, J. A. Hash, Barbara W. Morgan, T. H. Parry

Instructor: Elizabeth B. Galloway

Ed 100—Orientation—1 cr. (1 and 0)
Series of lectures and discussions on teaching and careers in education; personal and professional guidance. Required of all students in Elementary Education, Secondary Education, and Science Teaching.

Ed 101—Reading Improvement—1 cr. (0 and 2)
Developmental reading for University students who desire to improve reading skills; open to any University student, but priority given to referrals.

Ed 301—History of American Education—3 cr. (3 and 0)
Development of educational systems, theories and practices against a background of American social and intellectual history. *Prerequisite:* Junior standing or permission of the instructor.

Ed 302—Educational Psychology—3 cr. (3 and 0)
The nature, capacities, equipment, growth and development of the learner.

Ed 334—Child Growth and Development—3 cr. (3 and 0)
A study of the physical and emotional growth and development of the child. *Prerequisite:* Ed 302 or Psych 201.

Ed 335—Adolescent Growth and Development—3 cr. (3 and 0)
The physical and emotional growth and development of the adolescent. *Prerequisite:* Ed 302 or Psych 201.

Ed 336—Behavior of the Preschool Child—3 cr. (2 and 2)
A study of behavior of the preschool child, including observation and participation.

Ed 401—The Community College—3 cr. (3 and 0)
History and philosophy of the junior college, its functions, organization and administration.

Ed 405—Principles of Guidance—3 cr. (3 and 0)
Principles, procedures, and policies of the guidance services. For all personnel workers. *Prerequisite:* 6 semester hours in Education or Psychology.

Ed 406—History and Philosophy of Education—3 cr. (3 and 0)
An analysis of the development of modern education practices and philosophies with emphasis upon the historical and philosophical development in the United States.

Ed 412—Directed Teaching in Secondary School Subjects—6 cr. (1 and 15)
A program of supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for prospective teachers to obtain experiences in the subject area. Students to be sectioned according to teaching fields: English, History and Social Sciences, Mathematics,

Modern Languages, Science. (Enrollment is subject to individual approval of instructor in charge and is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio necessary for graduation.)

ED 424—METHODS AND MATERIALS IN SECONDARY SCHOOL INSTRUCTION—3 cr. (3 and 0)
Development of instructional practices and materials appropriate for the secondary school; familiarization with curriculum materials. Students to be sectioned according to teaching area: English, History and Social Science, Mathematics, Modern Languages, Science.

ED 431—SPECIAL INSTITUTE COURSE: EARLY CHILDHOOD EDUCATION—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 432—SPECIAL INSTITUTE COURSE: ELEMENTARY SCHOOL—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 433—SPECIAL INSTITUTE COURSE: SECONDARY SCHOOL—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 434—SPECIAL INSTITUTE COURSE: CURRENT PROBLEMS IN EDUCATION—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 435—SPECIAL INSTITUTE COURSE: CURRICULUM—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 436—SPECIAL INSTITUTE COURSE: SUPERVISION AND ADMINISTRATION—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 458—HEALTH EDUCATION—3 cr. (3 and 0)
A study of the information needed for effective cooperation with parents, physicians and public health agencies in the promotion and improvement of community health, including problems of personal hygiene, health records, immunization, and control of communicable disease.

ED 459—FUNDAMENTALS OF BASIC READING—3 cr. (3 and 0)
Study of reading skills in relation to the psychological bases; developmental principles; historical and current issues in reading practices.

ED 460—CURRICULUM DEVELOPMENT IN THE ELEMENTARY SCHOOL—3 cr. (3 and 0)
An analysis and evaluation of newer practices in curriculum planning in the elementary school.

ED 461—TEACHING READING IN THE ELEMENTARY SCHOOL—3 cr. (3 and 0)
Study of the various phases of reading and their relation to the elementary program. Emphasis on modern practices in the classroom teaching of reading.

ED 462—READING DIAGNOSIS AND REMEDIATION—3 cr. (2 and 3)
A clinical course in diagnostic and remedial procedures in the teaching of reading. Practice in the use of diagnostic instruments, interpretation of results, and case studies, with recommended remediation. Laboratory hours to be arranged with each individual. *Prerequisite:* 3 semester hours in reading or permission of the instructor.

Ed 465—Secondary School Curriculum—3 cr. (3 and 0)
A study of the principles, techniques, and trends in second school curriculum development and evaluation.

Ed 466—Curriculum for Early Childhood Education—3 cr. (3 and 0)
Critical study of early childhood curriculum for nursery schools, kindergarten and early elementary grades.

Ed 471—The Exceptional Child—3 cr. (3 and 0)
Survey of exceptionality including handicapped and gifted children; nature, cause, and treatment of difficulties; educational problems.

Ed 472—Psychology of Mental Retardation—3 cr. (3 and 0)
Psychological aspects of mental retardation; learning, motivation, and personality development.

Ed 473—Teaching the Mentally Retarded—3 cr. (3 and 0)
Study, selection, and preparation of curricular materials; methods of teaching retarded children within the pre-adolescent and adolescent range. *Prerequisite:* Ed 472 or equivalent.

Ed 480—Methods and Materials in the Elementary School—3 cr. (3 and 0)
Study of the elementary program with emphasis upon materials, curriculum and methodology.

Ed 481—Directed Teaching in the Elementary School—6 cr. (1 and 15)
Supervised observation and teaching experiences in cooperation with selected elementary schools. (Enrollment is subject to individual approval of the instructor and is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

Ed 483—Methods and Materials for Early Childhood Education—3 cr. (3 and 0)
Study of methods and materials applicable to nursery schools, kindergarten and early elementary grades.

Ed 484—Directed Teaching in Early Childhood Education—6 cr. (1 and 15)
Supervised observation and teaching experiences in cooperation with nursery, kindergartens and early elementary schools. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

Ed 487—Methods and Materials in Speech Development—3 cr. (3 and 0)
Approved methods of teaching speech development; study of materials; experience in clinical methodology.

Ed 491—Descriptive Statistics—3 cr. (3 and 0)
Basic descriptive statistics and research methodology applicable to education, psychology and other social sciences.

Ed 494—School and Community Relationships—3 cr. (3 and 0)
A study of the interdependence of the school and community, with emphasis on educational implications.

Ed 497—Audio-Visual Aids in Education—3 cr. (3 and 0)
The techniques and uses of audio-visual aids in improving teaching effectiveness.

Ed 498—Teaching Secondary School Reading—3 cr. (3 and 0)
Methods and materials of teaching basic and developmental reading skills; programming special services in reading instruction. Demonstrations of tests and devices.

Ed 701—The Community College—3 cr. (3 and 0)

Ed 705—Principles of Guidance—3 cr. (3 and 0)

Ed 706—History and Philosophy of Education—3 cr. (3 and 0)

Ed 731—Special Institute Course: Early Childhood Education—3 cr. (3 and 0)

Ed 732—Special Institute Course: Elementary School—3 cr. (3 and 0)

Ed 733—Special Institute Course: Secondary School—3 cr. (3 and 0)

Ed 734—Special Institute Course: Current Problems in Education—3 cr. (3 and 0)

Ed 735—Special Institute Course: Curriculum—3 cr. (3 and 0)

Ed 736—Special Institute Course: Supervision and Administration—3 cr. (3 and 0)

Ed 760—Curriculum Development in the Elementary School—3 cr. (3 and 0)

Ed 762—Reading Diagnosis and Remediation—3 cr. (2 and 3)

Ed 765—Secondary School Curriculum—3 cr. (3 and 0)

Ed 771—The Exceptional Child—3 cr. (3 and 0)

Ed 772—Psychology of Mental Retardation—3 cr. (3 and 0)

Ed 773—Teaching the Mentally Retarded—3 cr. (3 and 0)

Ed 787—Methods and Materials in Speech Development—3 cr. (3 and 0)

Ed 794—School and Community Relationships—3 cr. (3 and 0)

Ed 797—Audio-Visual Aids in Education—3 cr. (3 and 0)

Ed 798—Teaching Secondary School Reading—3 cr. (3 and 0)

Ed 801—Seminar in Human Growth and Development—3 cr. (3 and 0)

Ed 802—Human Development: Psychology of Learning—3 cr. (3 and 0)

Ed 803—Advanced Methods of Teaching in the Secondary School—3 cr. (3 and 0)

Ed 804—Advanced Methods of Teaching in the Elementary Grades—3 cr. (3 and 0)

Ed 808—Educational Tests and Measurements—3 cr. (3 and 0)

Ed 809—Analysis of the Individual—3 cr. (3 and 0)

ED 810—TECHNIQUES OF COUNSELING—3 cr. (3 and 0)

ED 811—SCHOOL FINANCE—3 cr. (3 and 0)

ED 813—EDUCATIONAL AND VOCATIONAL INFORMATIONAL SERVICES AND PLACEMENT—3 cr. (3 and 0)

ED 814—FIELD EXPERIENCES IN ELEMENTARY SCHOOL GUIDANCE—3 cr. (2 and 3)

ED 815—FIELD EXPERIENCES IN SECONDARY SCHOOL GUIDANCE—3 cr. (2 and 3)

ED 816—FIELD EXPERIENCES IN PERSONNEL SERVICES IN HIGHER EDUCATION—3 cr. (2 and 3)

ED 817—CLINICAL STUDIES IN COUNSELING AND GUIDANCE—1 to 3 cr.

ED 818—FIELD PROBLEMS IN SCHOOL ADMINISTRATION AND SUPERVISION OF INSTRUCTION—3 cr. (2 and 3)

ED 830—TECHNIQUES OF SUPERVISION—THE PUBLIC SCHOOLS—3 cr. (3 and 0)

ED 831—EVALUATION OF SECONDARY SCHOOL INSTRUCTION—3 cr. (3 and 0) (Offered in Summer Sessions only.)

ED 832—EVALUATION OF INSTRUCTION IN THE ELEMENTARY SCHOOLS—3 cr. (3 and 0)

ED 851—ORGANIZATION AND ADMINISTRATION OF THE ELEMENTARY SCHOOL—3 cr. (3 and 0)

ED 852—ORGANIZATION AND ADMINISTRATION OF THE SECONDARY SCHOOL—3 cr. (3 and 0)

ED 861—ORGANIZATION AND SUPERVISION OF READING PROGRAMS—3 cr. (3 and 0)

ED 862—CLINICAL RESEARCH IN READING—3 cr. (3 and 0)

ED 863—PRACTICUM IN READING—3 cr. (2 and 2)

ED 871—INTERPERSONAL AND GROUP RELATIONSHIPS—3 cr. (3 and 0)

ED 890—INTRODUCTION TO RESEARCH IN EDUCATION—3 cr. (3 and 0)

ELECTRICAL ENGINEERING

Professors: R. W. GILCHRIST, J. W. LATHROP, J. T. LONG, J. C. MARTIN, J. N. THURSTON, L. C. WILCOX, *Head*

Associate Professors: W. L. BALL, T. L. DRAKE, B. E. GILLILAND, C. P. GOODIN, R. N. KERSEY, JR., H. V. POE, R. W. SNELSHIRE, M. L. WOLLA, W. T. ZINK

Assistant Professors: D. C. AMOSS, H. J. HELGERT, R. D. STINAFF

EE 298—DIGITAL COMPUTATION; SYSTEMS AND PROGRAMS—1 cr. (1 and 0) An introduction to digital computation and digital computer systems: Historical background; components of the computer system; information flow; storage; basic algorithms; flow charting; and introduction to instruction writing.

EE 299—DIGITAL COMPUTATION—2 cr. (1 and 3)
A programming course designed to prepare students for the efficient use of digital computers. Fortran and PL-1 languages are used. An ideal course for those desiring a short but comprehensive introduction to computing. *Prerequisite:* EE 298.

EE 303—INTRODUCTION TO ELECTRICAL ENGINEERING—3 cr. (3 and 0)
Principles of electrical engineering, with an introduction to circuits, electronics, measuring devices and machines. For students in Industrial Education. *Prerequisite:* Math 106, Phys 202 and 204.

EE 307—BASIC ELECTRICAL ENGINEERING—3 cr. (3 and 0)
Electrical engineering for students who need a strong background in the subject, but who are not planning to specialize in the field. A firm foundation in circuit theory is provided in this course. *Prerequisite:* Math 206, Phys 222 and 224.

EE 308—BASIC ELECTRICAL ENGINEERING—3 cr. (3 and 0)
A continuation of EE 307, with emphasis on electronics, instrumentation, and basic electromechanics. *Prerequisite:* EE 307.

EE 312—ELECTROMECHANICS—3 cr. (2 and 2)
The principles of energy conversion are introduced with emphasis on electromagnetic and electromechanical devices. From these, the mathematical and equivalent circuit models are developed, considering non-linear magnetic characteristics and linear approximation. These models facilitate representation of the devices in extended systems. In laboratory characteristics are studied of devices are saturable reactors, magnetic amplifiers, loudspeakers, transformers, d-c motors and generators, and a-c motors and generators. These characteristics are compared with those of the mathematical models. *Prerequisite:* EE 330, 331 and 340.

EE 315—INFORMATION THEORY—3 cr. (3 and 0)
A course designed for those interested in developing a precise definition of information, and then applying this definition to the study of communication. Coding and the effect of noise on the system will be discussed. In the last part of the course upper bounds on the rate at which a process can transmit information will be obtained. *Prerequisite:* Approval of department.

EE 320—ELECTRONICS I—2 cr. (2 and 0)
The fundamental principles of solid state electronic devices including the structural properties of semi-conductors, charge carrier motion, p-n junction theory, and electrical circuit models of transistors. Emphasis is given to the physical principles describing the operation of modern electronics components. *Prerequisite:* Phys 221, 222. Concurrent enrollment in EE 325.

EE 321—ELECTRONICS II—2 cr. (2 and 0)
Solid state circuit theory covering the design of small signal—low frequency amplifiers and multistage and feedback systems; applications involving operational amplifiers, field effect transistors and integrated circuits are covered. *Prerequisite:* EE 320, 330, 331. Concurrent enrollment in EE 326.

EE 325—Electronics and Electromagnetics Laboratory I—1 cr. (0 and 2)

Laboratory projects dealing with instrumentation and measurement procedures associated with solid state electronic devices and electromagnetic fields. *Prerequisite:* Concurrent enrollment in EE 320 and 340.

EE 326—Electronics and Electromagnetics Laboratory II—1 cr. (0 and 2)

Experimentation in electronics circuits design and electronic systems analysis, including integrated circuits. Projects relating to studies of time varying fields, transmission lines, wave guides, and antennas are included. *Prerequisite:* Concurrent enrollment in EE 321 and 341.

EE 327—Engineering Applications of Probability and Random Variables—3 cr. (3 and 0)

An introduction to probability and random variables with emphasis on engineering applications. Subjects which will be covered include: probability space, conditional probabilities, independent events, Bernoulii trials, random variables, distribution functions, functions of random variables, and correlation and power spectrum of stationary random processes. *Prerequisite:* Math 208.

EE 329—Logic and Computing Devices—3 cr. (2 and 2)

A study of logic with an introduction to propositional calculus and Boolean Algebra. Number systems and representation of information. The use of electric devices to implement logic functions and computing elements. The organization and structure of computing systems. *Prerequisite:* Approval of department.

EE 330—Systems I—2 cr. (2 and 0)

The systems concept and system analysis methods are developed. The system model is developed through the study of functions and data forms, perfect drivers, response, two terminal elements, system geometry, linear algebra and subsystems. Branch, node, mesh and state models are considered. Solution methods include the used of the analog and digital computer. Non-linear components are introduced in simple systems. *Prerequisite:* Math 208 or approval of department.

EE H330—Systems I—2 cr. (2 and 0)

A special honors course in which the systems concept and system analysis methods are developed. The system model is developed through the study of functions and data forms, perfect drivers, response, two terminal elements, system geometry, linear algebra and subsystems. Branch, node, mesh, and state models are considered. Solution methods include the use of the analog and digital computer. Non-linear components are introduced in simple systems. *Prerequisite:* Math 208 or approval of department.

EE 331—Electric Circuits Workshop I—2 cr. (0 and 4)

Computational sessions, demonstrations and laboratory projects are coordinated with EE 330 (Systems I) in the area of electrical phenomenon. Electrical instrumentation and measurement procedures are introduced to illustrate component modeling and network response. Applications involving both continuous and discrete behavior are discussed. Problem solving using digital and analog computers is emphasized. *Prerequisite:* Concurrent enrollment with EE 330.

EE H331—Electric Circuits Workshop I—2 cr. (0 and 4)
A special honors workshop including computational sessions, demonstrations, and laboratory projects are coordinated with EE H330 (Systems I) in the area of electrical phenomenon. Electrical instrumentation and measurement procedures are introduced to illustrate component modeling and network response. Applications involving both continuous and discrete behavior are discussed. Problem solving using digital and analog computers is emphasized. *Prerequisite:* Concurrent enrollment with EE H330.

EE 332—Systems II—2 cr. (2 and 0)
A continuation of Systems I. Transforms of equations and functions and formulation of system equations in the S-domain. Two-part and N-terminal components studies include input-output and transfer parameters, measurement procedures, and system reduction methods. Solution methods include the use of transforms, analog computers and digital computers. Optimization methods are introduced. *Prerequisite:* EE 330.

EE 333—Electric Circuits Workshop II—2 cr. (0 and 4)
A continuation of EE 331. Transfer function concepts, multi-terminal component modeling and computer simulations are among topics covered. A variety of electrical devices and systems are discussed including machinery and other energy conversion and solid state devices. *Prerequisite:* Concurrent enrollment in EE 332.

EE 340—Electric and Magnetic Fields I—2 cr. (2 and 0)
An introduction to classical electromagnetics. Topics include vector analysis, Coulomb's law, electric field intensity, Gauss's law, potential theory, solution of Laplace's equation, D.C. magnetic fields, magnetic circuits and devices, and forces in magnetic fields. *Prerequisite:* Phys 222, Math 208.

EE 341—Electric and Magnetic Fields II—2 cr. (2 and 0)
Continuation of EE 340 to include time-varying fields, Maxwell's equations, transmission lines, waveguides, and antennas. *Prerequisite:* EE 340.

EE 350—Digital Information Processing—3 cr. (2 and 2)
Introduction to the basic characteristics of general purpose digital computer systems. The computer is viewed as a discrete sequential processor operating on discrete data rather than as a high speed calculating device. Topics include: general machine organization and operation, information flow within the machine, internal and external data types and structures, data transfers and communication with external devices, and interrelations between software and hardware. The various levels of programming systems are reviewed, but the main emphasis is placed on lower-level languages which provide the means for more flexible control and utilization of the digital system. *Prerequisite:* Junior standing in engineering or physical sciences and consent of instructor.

EE 351—Real Time Application of Digital Computers—3 cr. (2 and 2)
An introduction of the application and operation of digital computers in a real-time or near real-time environment. An extension of the topics of EE 350 with the main emphasis on real-time applications and on-line data acquisition and reduction. Topics include: hardware characteristics such as interrupt and data break facilities, analog-to-digital and digital-to-analog signal conversion, timing considerations, and programming systems. The utilization of the com-

puter as a system control component is considered as well as its use in simulation. *Prerequisite:* EE 350 or approval of department.

EE 401—SEMINAR—1 cr. (1 and 0)

Emphasis is placed on methods of presenting engineering concepts appropriate to an industrial environment. Recent developments in the field of electrical engineering are discussed as examples with consideration being given to their economic as well as scientific significance. A library research paper is a required part of the course. *Prerequisite:* Senior standing.

EE 402—ENGINEERING ANALYSIS—1 cr. (1 and 0)

The application of engineering principles and methods to the study of typical problems that arise in the various fields of electrical engineering. *Prerequisite:* EE 401 and Senior standing.

EE 403—ENERGY CONVERSION—3 cr. (3 and 0)

Various methods of energy conversion, both electromechanical and direct. Fuel cells, magnetohydrodynamics, nuclear and other methods are discussed along with more conventional systems. *Prerequisite:* Approval of department.

EE 405—SPECIAL PROBLEMS—Variable credit.

Electrical Engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. *Prerequisite:* Approval of department.

EE H405—SPECIAL PROBLEMS—Variable credit.

A special honors course of Electrical Engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. *Prerequisite:* Approval of department.

EE 406—INTRODUCTION TO INTEGRATED CIRCUITS—3 cr. (3 and 0)

Integrated circuit technology, devices and applications. Discussion of fabrication methods, survey of standard circuit characteristics, design and layout principles, linear and digital circuit applications. *Prerequisite:* Senior standing.

EE 410—SYSTEMS III—3 cr. (3 and 0)

An extension of Systems II into more advanced topics including flow concepts, stability, synthesis, optimization, and analysis with digital machines using—CSMP-ECAP and other simulation programs. *Prerequisite:* EE 332.

EE 411—ELECTRICAL SYSTEMS WORKSHOP III—2 cr. (0 and 4)

A continuation of EE 333. Larger more complex systems are considered. Projects illustrating state space and classical control theory are undertaken. Network synthesis and analysis through digital simulations are also covered. *Prerequisite:* EE 333.

EE 419—ELECTRICAL MACHINERY LABORATORY I—1 cr. (0 and 2)

A laboratory course designed to accompany EE 421. Includes measurements of A.C. and D.C. machine parameters, analog computer simulation with emphasis on control. *Prerequisite:* Enrollment in EE 421.

EE 420—POWER SYSTEMS ANALYSIS—3 cr. (3 and 0)

Study of electric power system operation. Subjects covered include transmission lines, load-flow studies, economic dispatching, symmetrical components, fault calculations, and introduction to power system stability. *Prerequisite:* EE 312.

EE 421—ELECTRICAL MACHINERY—3 cr. (3 and 0)
Characteristics of A.C and D.C. machines are studied with emphasis on dynamic operation and control. *Prerequisite:* EE 333.

EE 422—ELECTRONICS III—2 cr. (2 and 0)
An introduction to logic circuits, switching devices, and electronic storage systems. Frequency response of electronic components and systems, oscillator fundamentals, principles of modulation and power supply design are also covered. *Prerequisite:* EE 321, EE 333.

EE 428—COMMUNICATIONS THEORY I—3 cr. (3 and 0)
A course in modern communications theory. Topics covered are Fourier transforms, power spectra, correlation, signals in linear networks, amplitude modulation, frequency modulation, sampling and pulse modulation. *Prerequisite:* EE 321.

EE 429—FUNDAMENTALS OF DIGITAL COMPUTER DESIGN—3 cr. (3 and 0)
This course is designed for senior engineering and science students who are interested in the organization, logic, and circuit aspects of digital computers. Preliminary investigation of algorithms for performing digital arithmetic operations is followed by a study of logic circuits, switching matrices, computer elements and computer organization. The course is concluded with the design of a digital computer. *Prerequisite:* EE 321.

EE 430—COMMUNICATIONS THEORY II—3 cr. (3 and 0)
A continuation of EE 428 with emphasis on the statistical properties of signals. Topics covered are random signals and noise, signal space and continuous channels, digital data systems, optimum detection theory. *Prerequisite:* EE 428 and 327.

EE 431—ADVANCED ELECTRONICS—3 cr. (3 and 0)
Active and passive wave-shaping, memory, and switching circuits. *Prerequisite:* EE 321 and concurrent registration in EE 433.

EE 432—INSTRUMENTATION—3 cr. (3 and 0)
Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments will be considered. Transduction devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature will be discussed. *Prerequisite:* EE 321 or approval of department.

EE 433—ADVANCED ELECTRONICS LABORATORY—1 cr. (0 and 2)
A laboratory course designed to accompany EE 431. *Prerequisite:* Concurrent registration in EE 431.

EE 435—COMMUNICATIONS CIRCUITS—3 cr. (3 and 0)
Communication circuits used in amplification, modulation, detection and other signal processing in modern communication systems. Recent developments in electronic devices, such as integrated circuits, will be considered as circuit components along with other solid state and vacuum electronic devices. *Prerequisite:* EE 422.

EE 436—RADIATION AND WAVE PROPAGATION—3 cr. (3 and 0)

Electromagnetic waves, waveguides, and antennas. *Prerequisite:* EE 341.

EE 437—LASER TECHNOLOGY AND APPLICATIONS—3 cr. (3 and 0)

An introduction to the design factors and operating principles of solid state, gas, and semiconductor lasers, couched in the language of electrical engineering and electron physics. Applications of laser technology to such areas as communications, computers, measurements, and medicine are presented. The theory and applications of holography are explored. Special problems and demonstrations relative to electrical engineering application of lasers are designed to augment the theoretical presentations.

EE 450—SYSTEMS IV—3 cr. (3 and 0)

A continuation of Systems III. Modern control system concepts including matrices and vector spaces, state equations, sample data systems, controllability and observability, non-linear systems and synthesis. Also advanced computations including analog, digital, and hybrid in optimizing, parametric programming and simulation. *Prerequisite:* EE 410.

EE 451—SYSTEM DESIGN WORKSHOP IV—2 cr. (0 and 4)

A project oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Prerequisite:* EE 411.

EE 460—COMPUTER-AIDED ANALYSIS AND DESIGN—3 cr. (3 and 0)

Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in the modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Prerequisite:* EE 332 or approval of department.

EE 461—ANALOG/HYBRID COMPUTATION AND SIMULATION—3 cr. (2 and 2)

A continuation of the introductory analog concepts considered in the EE 331 and 333. Topics include non-linear modeling, function generation, signal processing, and an introduction to hybrid computing. *Prerequisite:* EE 333 or approval of department.

EE 703—ENERGY CONVERSION—3 cr. (3 and 0)

EE 706—INTRODUCTION TO INTEGRATED CIRCUITS—3 cr. (3 and 0)

EE 710—SYSTEMS III—3 cr. (3 and 0)

EE 719—ELECTRICAL MACHINERY LABORATORY I—1 cr. (0 and 2)

EE 720—POWER SYSTEM ANALYSIS—3 cr. (3 and 0)

EE 721—ELECTRICAL MACHINERY—3 cr. (3 and 0)

EE 728—COMMUNICATIONS THEORY I—3 cr. (3 and 0)

EE 729—FUNDAMENTALS OF DIGITAL COMPUTER DESIGN—3 cr. (3 and 0)

EE 730—COMMUNICATIONS THEORY II—3 cr. (3 and 0)

EE 731—ADVANCED ELECTRONICS—3 cr. (3 and 0)

EE 733—ADVANCED ELECTRONICS LABORATORY—1 cr. (0 and 2)

EE 735—Communications Circuits—3 cr. (3 and 0)

EE 736—Radiation and Wave Propagation—3 cr. (3 and 0)

EE 750—Systems IV—3 cr. (3 and 0)

EE 760—Computer-Aided Analysis and Design—3 cr. (3 and 0)

EE 761—Analog/Hybrid Computation and Simulation—3 cr. (2 and 2)

EE 801—Analysis of Linear Systems I—3 cr. (3 and 0)

EE 802—Analysis of Linear Systems II—3 cr. (3 and 0)

EE 803—Seminar—1 cr. (1 and 0)

EE 804—Network Synthesis I—3 cr. (3 and 0)

EE 805—Network Synthesis II—3 cr. (3 and 0)

EE 806—Nonlinear Networks and Systems I—3 cr. (3 and 0)

EE 807—Power System Stability—3 cr. (3 and 0)

EE 808—Energy Conversion—3 cr. (3 and 0)

EE 810—Modern Control Theory I—3 cr. (3 and 0)

EE 811—Modern Control Theory II—3 cr. (3 and 0)

EE 812—Sampled Data Systems—3 cr. (3 and 0)

EE 814—Nonlinear Automatic Controls—3 cr. (3 and 0)

EE 815—Random Data Measurements and Analysis—3 cr. (3 and 0)

EE 819—Detection and Estimation Theory—3 cr. (3 and 0)

EE 820—Theory of Communications I—3 cr. (3 and 0)

EE 821—Theory of Communications II—3 cr. (3 and 0)

EE 822—Information Theory—3 cr. (3 and 0)

EE 823—Integrated Circuit Technology—3 cr. (3 and 0)

EE 824—Applications of Integrated Circuits—3 cr. (3 and 0)

EE 825—Solid-State Electronics—3 cr. (3 and 0)

EE 826—Large Scale Integration—3 cr. (3 and 0)

EE 827—Instrumentation and Measurements—3 cr. (3 and 0)

EE 830—Electromagnetics I—3 cr. (3 and 0)

EE 831—Electromagnetics II—3 cr. (3 and 0)

EE 832—Antenna Theory I—3 cr. (3 and 0)

EE 833—Antenna Theory II—3 cr. (3 and 0)

EE 834—Microwave Electronics—3 cr. (3 and 0)

EE 836—Optical Electromagnetics and Quantum Electronics—3 cr. (3 and 0)

BioE 846—Elements of Bioengineering I—3 cr. (3 and 0)

BioE 847—Elements of Bioengineering II—3 cr. (3 and 0)

EE 850—Computation and Simulation—3 cr. (3 and 0)

EE 851—Theory and Design of Digital-Analog-Machines—3 cr. (3 and 0)

EE 852—Digital Computers and Information Processing—3 cr. (3 and 0)

EE 857—Coding Theory—3 cr. (3 and 0)

EE 858—Automata Theory—3 cr. (3 and 0)

EE 860—Engineering Application of Optimization—3 cr. (3 and 0)

EE 861—Foundation and Methodology of Systems Engineering—3 cr. (3 and 0)

EE 863—Advanced Physical Systems I—3 cr. (3 and 0)

EE 864—Advanced Physical Systems II—3 cr. (3 and 0)

EE 870—Biosystems Analysis—3 cr. (3 and 0)

EE 890—Selected Topics in Electrical Engineering—3 cr. (3 and 0)

EE 891—Research—3 cr.

EE 991—Doctoral Research—Credit to be arranged.

ENGINEERING

Engr 101—Engineering Systems—Non-credit (1 and 0)

A series of lectures outlining the role and scope of engineering in service to mankind. Emphasis is placed on the difference between science and engineering, the emerging role of engineering in new technology, the important technological needs of mankind, and the importance of the humanities and social studies to the engineer.

Engr 491—Seminar—1-3 cr. (1-3 and 0)

A study of the dynamic role of engineering in relationship to man and his environment. Topics not covered in formal courses will be presented to keep students abreast of today's rapidly changing technology. *Prerequisite:* Permission of instructor.

ENGINEERING GRAPHICS

Professor: E. Laitala, *Head*

Associate Professors: B. E. Dunkle, A. F. Hammond, L. H. Jameson, C. M. McHugh, R. L. Perry

Assistant Professors: C. W. Carter, C. D. Meeks

Instructor: C. O. Huey

EG 101—Freehand Sketching—1 cr. (0 and 3)

Principles of technical sketching, including the development of skills in technical lettering and freehand orthographic and pictorial drawing.

EG 103—Engineering Communications—3 cr. (1 and 6)

The role of engineering communication in engineering and management. Graphic communication includes lettering, sketching, orthographic projection, auxiliary projection, sections and conventional practices, dimensioning, working drawings. Architectural drawing, charts and graphs, presentation techniques. Manufacturing philosophy; interrelation between product design and production processes. For Industrial Management majors.

EG 104—Engineering Communication and Design—2 cr. (0 and 6)

The role of engineering communication from the manager's point of view. Working drawings relating product design and production processes. Architectural drawing nomography, charts and graphs, presentation techniques. *Prerequisite:* EG 109 or consent of instructor.

EG 105—Engineering Graphics—2 cr. (0 and 6)

A course in graphical communication. Freehand sketching, orthographic and auxiliary projection, sectional views, and conventional practices, dimensioning, reading drawings.

EG 109—Engineering Graphical Communication—2 cr. (0 and 6)

Graphical methods of communicating ideas and information in engineering. Development of the student's ability to visualize three dimensional forms and spatial relationships through the study of creative freehand sketching and basic fundamentals of engineering representation. Use of drafting aids, introduction to computer graphics, curve plotting, reproduction methods.

EG 110—Engineering Communication (For Technical Operations)—2 cr. (0 and 6)

A continuation of EG 109. Emphasis is placed on engineering drawing as a means of expressing a design. Standard practices and procedures. Dimensioning for interchangeability, numerical control, and quantity production. Component design. Developments and intersections.

EG 201—Engineering Graphics for Industrial Education—3 cr. (1 and 6)

A comprehensive study of Engineering Graphics fundamentals. The course includes lettering, use of instruments, technical sketching, multi-viewing drawing, auxiliary projection, descriptive geometry, sectional views, dimensioning, fasterners, detail and assembly drawings.

EG 202—Graphical Technology for Industrial Education—3 cr. (1 and 6)

Continuation of EG 201 with emphasis on depth in graphical communication. Working drawings to include detail and assembly drawings. Intersections and developments. Specifications, standards. Architectural drawings. Production illustration, pedagogy of graphics, pragmatic and creative design. *Prerequisite:* EG 201.

EG 301—Advanced Engineering Graphics—3 cr. (1 and 6)

Application of the fundamental principles of Engineering Graphics to the solution of three dimensional spatial problems in the design of various engineering systems. Creative functional design, introduction to graphical kinematics and computer-aided design. *Prerequisite:* EG 109 or 202.

EG 302—Graphical Computation—3 cr. (2 and 3)

Graphic layouts of empirical equations. The application of graphical solution of equations, nomography, and the graphical calculus to the solution of problems in engineering and science. Graphical solution of differential equations. *Prerequisite:* EG 109, Math 106 or equivalent.

ENGINEERING MANAGEMENT

Professors: C. C. Davis, B. J. Todd, C. H. Whitehurst, Jr.

Associate Professors: F. R. Gray, E. A. LaRoche, S. O. Park,[*] C. O. Shuler, J. M. Wannamaker

Assistant Professors: G. D. Riggs, J. A. Turner

EMgt 910—Seminar in Production Management—2 cr. (2 and 0)

EMgt 911—Seminar in Decision Theory—2 cr. (2 and 0)

EMgt 912—Seminar in Finance—3 cr. (3 and 0)

EMgt 913—Systems Analysis—3 cr. (3 and 0)

EMgt 991—Doctoral Research—Credit to be arranged.

ENGINEERING MECHANICS

Professors: N. R. Bauld, Jr., R. W. Moorman, *Head*

Associate Professors: W. E. Castro, R. E. Elling, J. G. Goree, A. G. Law, R. F. Nowack, M. K. Richardson, P. B. Zielinski

Assistant Professor: C. R. Mitchell

EM 201—Engineering Mechanics (Statics)—3 cr. (3 and 0)
Forces and force systems and their external effect on bodies; principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, concurrent registration in Math 206.

EM H201—Engineering Mechanics (Statics)—3 cr. (3 and 0)
An honors section of EM 201; admission by invitation.

EM 202—Engineering Mechanics (Dynamics)—3 cr. (3 and 0)
A continuation of EM 201. The principal topics are kinematics and kinetics of particles and bodies of finite size. Techniques of vector mathematics are employed. *Prerequisite:* EM 201, Math 206.

EM H202—Engineering Mechanics (Dynamics)—3 cr. (3 and 0)
An honors section of EM 202; admission by invitation.

EM 211—Particle Mechanics: Statics and Dynamics—3 cr. (3 and 0)
Force and force systems and their effect on particles; the conditions of equilibrium and the kinematics and kinetics of particle motion. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, Math 206.

EM 304—Mechanics of Materials—3 cr. (3 and 0)
The relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. *Prerequisite:* 201 and Math 206.

EM H304—Mechanics of Materials—3 cr. (3 and 0)
An honors section of EM 304; admission by invitation.

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[*] On leave.

EM 305—Mechanics of Materials Laboratory—1 cr. (0 and 3)
Theoretical relationships considered in EM 304 are verified. Students observe the behavior under load and the failure of engineering materials identify and evaluate mechanical properties of materials important to design and manufacturing processes; and are acquainted with various testing methods, testing machines, and instruments. *Prerequisite:* Must be accompanied or preceded by EM 304.

EM 320—Fluid Mechanics—3 cr. (3 and 0)
The behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is placed upon a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Prerequisite:* EM 202.

EM H320—Fluid Mechanics—3 cr. (3 and 0)
An honors section of EM 320; admission by invitation.

EM 322—Fluid Mechanics Laboratory—1 cr. (0 and 3)
The principles developed in EM 320 are verified and demonstrated. Familiarization with orderly techniques in organizing and reporting results of experimental investigations and with the use of instruments and equipment is afforded. *Prerequisite:* Must be accompanied or preceded by EM 320.

EM 420—Hydraulic Engineering—3 cr. (3 and 0)
Elements of hydrology and the application of principles of fluid mechanics to engineering problems. Topics included are open channel flow; flow in conduits under pressure; hydraulic machinery; and the broad principles of planning reservoirs, water supply systems, dams, spillways, and other hydraulic works. *Prerequisite:* EM 320.

EM 421—Hydrology and Hydraulics—2 cr. (2 and 0)
Elements of surface water and ground water hydrology are introduced and applied to engineering problems. Special topics of open channel hydraulics and water distribution systems are developed from the fundamentals of fluid mechanics. *Prerequisite:* EM 320.

EM 425—Advanced Mechanics of Materials—3 cr. (3 and 0)
A continuation of EM 304. This course includes traditional topics in strength of materials, such as shear center, unsymmetrical bending, torsion of non-circular sections, curved members, and elastic stability. Additionally, introduces topics from theory of elasticity as related to simple bending and torsion problems. *Prerequisite:* EM 304.

EM 450—Mechanical Vibrations—3 cr. (3 and 0)
Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include: linear free vibrations, forced vibrations and damping in single degree of freedom systems, transient response, multidegree of freedom systems with lumped parameters, Lagrange's equations. *Prerequisite:* EM 202, 304, and Math 208.

EM 470—Experimental Stress Analysis I—3 cr. (2 and 3)
Experimental analysis of static and dynamic stress fields. Emphasis is on the techniques required to obtain data and the theoretical analysis required for proper interpretation. Methods and instrumentation associated with strain gages (including transducer applications), brittle laquers, and photoelasticity will be studied. *Prerequisite:* EM 304 and permission of instructor.

EM 721—HYDROLOGY AND HYDRAULICS—2 cr. (2 and 0)

EM 725—ADVANCED MECHANICS OF MATERIALS—3 cr. (3 and 0)

EM 750—MECHANICAL VIBRATIONS—3 cr. (3 and 0)

EM 770—EXPERIMENTAL STRESS ANALYSIS I—3 cr. (2 and 3)

EM 802—EXPERIMENTAL STRESS ANALYSIS II—3 cr. (2 and 3)

EM 821—CONTINUUM MECHANICS—3 cr. (3 and 0)

EM 823—DIMENSIONAL ANALYSIS AND DYNAMIC SIMILARITY—3 cr. (3 and 0)

EM 827—TOPICS IN ANALYTICAL MECHANICS—3 cr. (3 and 0)

EM 829—ENERGY METHODS AND VARIATIONAL PRINCIPLES—3 cr. (3 and 0)

EM 831—THEORY OF ELASTICITY I—3 cr. (3 and 0)

EM 832—THEORY OF ELASTICITY II—3 cr. (3 and 0)

EM 834—THEORY OF ELASTIC STABILITY—3 cr. (3 and 0)

EM 845—INTERMEDIATE DYNAMICS—3 cr. (3 and 0)

EM 851—FLUID DYNAMICS—3 cr. (3 and 0)

EM 852—THEORY OF IDEAL FLUID FLOW—3 cr. (3 and 0)

EM 853—THEORY OF VISCOUS FLUID FLOW—3 cr. (3 and 0)

EM 856—FLOW IN OPEN CHANNELS—3 cr. (3 and 0)

EM 881—SPECIAL PROBLEMS—3 cr. (3 and 0)

EM 889—SEMINAR—0 or 1 cr. (1 and 0)

EM 890—SEMINAR—0 or 1 cr. (1 and 0)

EM 891—RESEARCH—Credit to be arranged.

EM 932—THEORY OF PLASTICITY—3 cr. (3 and 0)

EM 980—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 981—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 982—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 983—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 991—DOCTORAL RESEARCH—Credit to be arranged.

ENGLISH

Professors: R. J. Calhoun,* H. M. Cox, C. B. Green, M. A. Owings, *Head*

Associate Professors: C. O. Caskey, A. J. Fear, H. M. Felder, Jr., C. Gum, Harriet R. Holman, A. H. Holt, J. L. Idol, C. M. McGee, Jr., J. J. McLaughlin, N. Olsen, Jr., M. S. Steadman, Jr., C. H. Watson, J. P. Winter

Assistant Professors: R. E. Barfield, H. B. Bryant, R. L. Cross, T. E. Douglass, H. B. Hannah, L. L. Henry, C. M. Israel, A. L. Recoulley III, R. O. Rogers, Corinne H. Sawyer, J. B. Simms, B. N. Skardon, R. T. Sorrells, M. O. Usrey, E. P. Willey

Instructors: Ottie W. Arrington, Marie I. Binsse, J. D. Blanche, W. V. Bost, Joan T. Cross, S. K. Eisiminger, G. L. Findlen, Virginia L. Ganim, D. N. Griffin, R. B. Heaton, Jr., W. B. Wood, Jr., C. H. Woodell

Lecturer: Ann M. Young

Engl 101—English Composition—3 cr. (3 and 0)
Training in correct and effective expression, in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods.

Engl H101—English Composition—3 cr. (3 and 0)
Honors section of Engl 101; admission by invitation.

Engl 102—English Composition—3 cr. (3 and 0)
Continued emphasis on correct and effective expression; an introduction to non-fiction prose, fiction, drama, and poetry; training in the organization and writing of the research report. *Prerequisite:* Engl 101.

Engl H102—English Composition—3 cr. (3 and 0)
Honors section of Engl 102; admission by invitation.

Engl 105—Fundamentals of Oral Communication—3 cr. (3 and 0)
Introduction to the problems of oral communication in the following areas: oral reading, listening, discussion, speaking, with emphasis on individual needs; oral exercises.

Engl 111—English for Foreign Students—3 cr. (5 and 0)
A special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examinations in oral English.

Engl 203—A Survey of English Literature—3 cr. (3 and 0)
Chief British authors and works from Beowulf through the Romantic period; continued emphasis on composition. *Prerequisite:* Engl 102.

Engl H203—Survey of English Literature—3 cr. (3 and 0)
Honors section of Engl 203; admission by invitation.

Engl 204—A Survey of English and American Literature—3 cr. (3 and 0)
Chief British authors and works from the Victorian period to the present

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* On leave.

time, and selected readings from American literature. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 203.

Engl H204—Survey of English and American Literature—3 cr. (3 and 0)

Honors section of Engl 204; admission by invitation.

Engl 215—Introduction to Drama—3 cr. (3 and 0)

Introduction to drama as a literary form through readings of representative plays from Aeschylus to Ibsen. *Prerequisite:* Engl 101, 102. (Formerly Engl 415.)

Engl 217—Vocabulary Building—3 cr. (3 and 0)

Development of a useful, discriminating vocabulary for writing, speaking, and reading. Student notebooks and proficiency quizzes. *Prerequisite:* Engl 101 and 102.

Engl 221—The Classics in Translation—3 cr. (3 and 0)

An examination of the whole of the *The Iliad, The Odyssey, Hesiod's Theogony, The Aeneid, The Metamorphoses,* Apuleius's *The Golden Asse,* and selections from Herodotus and Tacitus. *Prerequisite:* Engl 101, 102.

Engl 223—Continental Fiction in Translation—3 cr. (3 and 0)

Selected fiction of the European masters, primarily Russian, French, German, and Spanish. *Prerequisite:* Engl 101, 102.

Engl 231—Introduction to Journalism—3 cr. (3 and 0)

Instruction and practice in writing for mass media; editorial responsibilities. *Prerequisite:* Engl 102.

Engl 240—Black American Literature—3 cr. (3 and 0)

Black American literature from its beginning to the present. A critical examination of essays, short stories, novels, drama, and poetry produced by the Black American. *Prerequisite:* Engl 101 and 102.

Engl 300—Journalism Workshop—1 cr. (1 and 0)

Responsibilities and duties of students editing uncensored publications; criticism of student publications. Open only to members of publication staffs. *Prerequisite:* Engl 102.

Engl 301—Public Speaking—3 cr. (3 and 0)

Practical training in public speaking; attention to diction, voice, and platform presence; an introduction to parliamentary procedure; practice in writing and delivering short speeches. *Prerequisite:* Engl 203 and 204.

Engl 302—Persuasion—3 cr. (3 and 0)

The theories and art of ethical oral persuasion. The composition and delivery of speeches of a persuasive nature to convince, to stimulate, and to actuate. *Prerequisite:* Engl 301.

Engl 303—Voice and Diction—3 cr. (3 and 0)

Practical training in speech, with emphasis on clarity, vocal variety, and tone quality.

Engl 304—Advanced Composition—3 cr. (3 and 0)

Supervised writing for students of advanced standing, each student undertaking projects according to his interest; some attention to reports, business letters, research methods and materials. Weekly papers and some larger exercises. Limited enrollment. *Prerequisite:* Engl 203 and 204.

ENGL 305—ORAL INTERPRETATION OF LITERATURE—3 cr. (3 and 0)
Analysis and oral interpretation of selected poetry and prose; training in development of effective tone production. *Prerequisite:* Engl 101, 102.

ENGL 306—DEBATING—1 cr. (1 and 0)
The application of debating to contemporary problems. May be repeated until a maximum of three credits has been earned. *Prerequisite:* Permission of the instructor.

ENGL 310—INTRODUCTION TO THE THEATRE—3 cr. (3 and 0)
The history of play production from the Greeks to modern times. The role of lighting, costuming, set design and other elements in play production. *Prerequisite:* Junior standing.

ENGL 311—THEATRE LABORATORY—1 cr. (0 and 3)
Participation in theatre production including stage management, direction, costume, makeup, lighting, sound, scenery, and business management. No formal class meetings. One credit. May be repeated for a total of three credits. *Prerequisite:* Sophomore standing and permission of the instructor.

ENGL 331—CREATIVE WRITING—3 cr. (3 and 0)
The technique of non-expository writing—narration, description, dramatization. *Prerequisite:* Sophomore standing or higher and permission of the instructor.

ENGL 332—CREATIVE WRITING—3 cr. (3 and 0)
A continuation of Engl 331. *Prerequisite:* Engl 331 or permission of the instructor.

ENGL 333—THE STRUCTURE OF FICTION—3 cr. (3 and 0)
A study of the short story, the novella, and the novel from the writer's point of view. *Prerequisite:* Permission of the instructor.

ENGL 351—CHILDREN'S LITERATURE—3 cr. (3 and 0)
Wide reading in prose and verse suitable for children. *Prerequisite:* Engl 203 and 204.

ENGL 362—SPEECH IN THE ELEMENTARY CLASSROOM—3 cr. (3 and 0)
The development of oral communication skills in children and the use of speech improvement activities to motivate spontaneous, accurate self-expression. *Prerequisite:* Junior standing.

ENGL 402—THE ENGLISH LANGUAGE—3 cr. (3 and 0)
Studies in English usage and the historical development of the language. *Prerequisite:* Engl 203 and 204.

ENGL 404—THE STRUCTURE OF MODERN ENGLISH—3 cr. (3 and 0)
Structural linguistic analysis; principles of phonology, morphology, and syntax as related to traditional, structural, and transformational grammars. Recommended for English teachers. *Prerequisite:* Engl 203, 204.

ENGL 405—SHAKESPEARE—3 cr. (3 and 0)
An introduction to Shakespeare's plays through a study of the tragedies *Hamlet, Othello, King Lear, Macbeth, Anthony* and *Cleopatra,* and of the two tragic plays *Romeo and Juliet* and *Julius Caesar. Prerequisite:* Engl 203, 204.

ENGL 406—SHAKESPEARE—3 cr. (3 and 0)
A selective study of Shakespeare's comedies and histories. *Prerequisite:* Engl 203 and 204.

ENGL 409—CHAUCER—3 cr. (3 and 0)
Chaucer as an artist; the "Prologue" for historical and linguistic orientation; "The Canterbury Tales," "House of Fame," "Parliament of Fowls," and "Troilus and Criseyde" as art forms. *Prerequisite:* Engl 203 and 204.

ENGL 413—CLASSICAL DRAMA—3 cr. (3 and 0)
Selected readings in the dramatic literature of classical Greece and Rome. *Prerequisite:* Engl 203 and 204.

ENGL 416—MODERN DRAMA—3 cr. (3 and 0)
Principles and progress of drama from Ibsen to the present; analysis of representative plays; critical reports; discussion of trends in contemporary drama. *Prerequisite:* Engl 203 and 204.

ENGL 423—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
The colonial period to the Civil War, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 424—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
From the Civil War to the present, with emphasis upon major authors. *Prerequisite:* Engl 203 and 204.

ENGL 425—THE ROMANTIC REVIVAL—3 cr. (3 and 0)
The eighteenth-century forerunners of Romanticism; Wordsworth, Coleridge, Byron, Shelley, Keats; the essayists. *Prerequisite:* Engl 203 and 204.

ENGL 427—VICTORIAN POETRY AND PROSE—3 cr. (3 and 0)
Representative works from the prose and poetry of Victorian writers; consideration of English intellectual, social, and political life of the period. *Prerequisite:* Engl 203 and 204.

ENGL 431—THE RESTORATION AND EIGHTEENTH CENTURY—3 cr. (3 and 0)
Readings in Dryden, Swift, Pope, and Dr. Johnson. *Prerequisite:* Engl 203 and 204.

ENGL 435—SOUTHERN LITERATURE—3 cr. (3 and 0)
The intellectual and literary achievement of the South from 1607 to the present, with emphasis upon the writers of the nineteenth century. *Prerequisite:* Engl 203 and 204.

ENGL 436—MILTON AND HIS AGE—3 cr. (3 and 0)
The development of Milton's thought and art in relation to his times and to the writings of his contemporaries. *Prerequisite:* Engl 203 and 204.

ENGL 437—THE ENGLISH NOVEL—3 cr. (3 and 0)
A critical and historical study of the English novel from Defoe to Jane Austen. *Prerequisite:* Engl 203 and 204.

ENGL 438—TWENTIETH CENTURY POETRY—3 cr. (3 and 0)
The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. *Prerequisite:* Engl 203 and 204.

ENGL 439—TWENTIETH CENTURY FICTION—3 cr. (3 and 0)
American and British novelists and short story writers of the twentieth century. *Prerequisite:* Engl 203 and 204.

ENGL 440—APPLIED LITERARY CRITICISM—3 cr. (3 and 0)
Major critical approaches to literature, in theory and practice, from Aristotle to the present. *Prerequisite:* Engl 203 and 204.

ENGL 441—A SURVEY OF WORLD LITERATURE I—3 cr. (3 and 0)
Translations from the Hellenic, Hebraic, and Oriental worlds, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 442—A SURVEY OF WORLD LITERATURE II—3 cr. (3 and 0)
Translations from the Medieval, Renaissance and Modern worlds, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 443—SEVENTEENTH CENTURY POETRY AND PROSE—3 cr. (3 and 0)
A survey of British authors of the seventeenth century other than Shakespeare and Milton.

ENGL 445—RENAISSANCE NON-DRAMATIC LITERATURE—3 cr. (3 and 0)
Tudor and Elizabethan poetry, prose fiction, translations, essays, and criticism. *Prerequisite:* Engl 204.

ENGL 446—TUDOR-STUART DRAMA—3 cr. (3 and 0)
Selected readings in non-Shakespearean dramatic literature of the sixteenth and seventeenth centuries. *Prerequisite:* Engl 203 and 204.

ENGL 447—THE AMERICAN NOVEL—3 cr. (3 and 0)
A survey of the most significant forms and themes of the American novel from its beginnings to 1920. *Prerequisite:* Engl 203 and 204.

ENGL 461—STUDIES IN ENGLISH LITERATURE TO 1784—3 cr. (3 and 0)
Selected readings in English literature from the beginnings to 1700, with emphasis on social and intellectual backgrounds. *Prerequisite:* Engl 203, 204.

ENGL 462—STUDIES IN ENGLISH LITERATURE SINCE 1784—3 cr. (3 and 0)
Selected readings in English literature from 1700 to the present, with emphasis on social and intellectual backgrounds. *Prerequisite:* Engl 203, 204.

ENGL H470—SENIOR DIVISION HONORS ENGLISH—3 cr. (3 and 0)
An intensive study of a period, topic, genre, or figure. Papers, reports, reading list, examination. *Prerequisite:* Engl 203, 204 or H203, H204 and approval of the Honors Council. May be repeated by arrangement with the Department for a total of twelve credits.

ENGL 481—DIRECTED READING—1, 2, or 3 cr. (1, 2, or 3 and 0)
Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. May be repeated for a maximum of six credits. *Prerequisite:* Engl 203, 204 or H203, H204, and invitation of the department.

ENGL 651—CHILDREN'S LITERATURE—3 cr. (3 and 0)

ENGL 702—THE ENGLISH LANGUAGE—3 cr. (3 and 0)

ENGL 704—THE STRUCTURE OF MODERN ENGLISH—3 cr. (3 and 0)

ENGL 705—SHAKESPEARE—3 cr. (3 and 0)

ENGL 706—SHAKESPEARE—3 cr. (3 and 0)

ENGL 709—CHAUCER—3 cr. (3 and 0)

ENGL 716—DRAMA—3 cr. (3 and 0)

ENGL 723—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 724—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 725—THE ROMANTIC REVIVAL—3 cr. (3 and 0)

ENGL 727—VICTORIAN POETRY AND PROSE—3 cr. (3 and 0)

ENGL 731—THE RESTORATION AND EIGHTEENTH CENTURY—3 cr. (3 and 0)

ENGL 735—SOUTHERN LITERATURE—3 cr. (3 and 0)

ENGL 736—MILTON AND HIS AGE—3 cr. (3 and 0)

ENGL 738—TWENTIETH CENTURY POETRY—3 cr. (3 and 0)

ENGL 739—TWENTIETH CENTURY FICTION—3 cr. (3 and 0)

ENGL 740—APPLIED LITERARY CRITICISM—3 cr. (3 and 0)

ENGL 741—A SURVEY OF WORLD LITERATURE—3 cr. (3 and 0)

ENGL 742—A SURVEY OF WORLD LITERATURE—3 cr. (3 and 0)

ENGL 743—SEVENTEENTH CENTURY POETRY AND PROSE—3 cr. (3 and 0)

ENGL 745—RENAISSANCE NON-DRAMATIC LITERATURE—3 cr. (3 and 0)

ENGL 747—THE AMERICAN NOVEL—3 cr. (3 and 0)

ENGL 761—STUDIES IN ENGLISH LITERATURE TO 1784—3 cr. (3 and 0)

ENGL 762—STUDIES IN ENGLISH LITERATURE SINCE 1784—3 cr. (3 and 0)

ENGL 801—THE TEACHING OF ENGLISH—3 cr. (3 and 0)

ENGL 803—SEMINAR—3 cr. (3 and 0)

ENGL 805—SEMINAR—3 cr. (3 and 0)

ENGL 890—INTRODUCTION TO RESEARCH—1 cr. (1 and 0)

ENGL 891—RESEARCH—Credit to be arranged.

ENTOMOLOGY

Professors: T. R. ADKINS, JR., R. C. FOX, E. W. KING, J. K. REED
Associate Professor: S. B. HAYS, *Head*
Assistant Professors: R. F. NASH, T. E. SKELTON

ENT 200—INSECTS—2 cr. (2 and 0)
An introduction to insects; their various relationships with man, other animals and plants. The general nature of this course makes it beneficial to all students regardless of specialty.

ENT 301—GENERAL ENTOMOLOGY—3 cr. (2 and 3)
A general introduction to entomology with emphasis on anatomy, metamorphosis, and description of the most common insect species. Methods of control are introduced and current control practices are explained for some of the most important species.

ENT 307—FOREST ENTOMOLOGY—3 cr. (2 and 3) F
Insects of economic importance to forests, forest products and shade trees, and their role in the practice of good forest management as well as their significance in the natural environment.

ENT 308 APICULTURE—3 cr. (2 and 3)
A detailed study of the honey bee and its economic importance in pollination and honey production. Attention will be given to bee behavior, colony

management, equipment, honey plant identification, and honey production and processing. *Prerequisite:* Zool 101, 103 and permission of the instructor.

ENT 401—FIELD CROP AND STORED PRODUCT INSECTS—3 cr. (2 and 3)
Common insect pests of the following are studied: cotton, corn, small grains, legume field crops, tobacco, stored grain and seed. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

ENT 402—FRUIT, NUT, AND VEGETABLE INSECTS—3 cr. (2 and 3)
Common insect pests of the following are studied: peaches, apples, grapes, pecans, sweet corn, cole crops, cucurbits, potatoes, sweet potatoes, peas and beans. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

ENT 405—INSECT MORPHOLOGY—4 cr. (3 and 3) F
A study of insect structure in relation to function and of the variation of form in insects. *Prerequisite:* Ent 301.

ENT H405—INSECT MORPHOLOGY—4 cr. (3 and 3) F
Honors option for Ent 405, admission by special arrangement.

ENT 410—INSECT TAXONOMY—3 cr. (1 and 6)
The identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification; lecture material deals with necessary theoretical discussion of taxonomic features observed in the laboratory. *Prerequisite:* Zool 101, 103; Ent 301; Ent 405 desirable.

ENT 455—MEDICAL AND VETERINARY ENTOMOLOGY—3 cr. (2 and 3) S
Insects and their arthropod relatives which are of considerable economic importance in their effect on man and animals.

ENT 461—SEMINAR—1 cr. (1 and 0) F
Students review the principal journals pertaining to insects and related animals; also review the lives and activities of prominent pioneer entomologists. *Prerequisite:* Zool 101, 103; Ent 301.

ENT 462—SEMINAR—1 cr. (1 and 0) S
Continuation of Ent 461.

ENT 468—INTRODUCTION TO RESEARCH—2 cr. (1 and 3) S
Principles, developments and changes in research methods related to certain fields of biological and agricultural research. The students obtain practice in experimental techniques, scientific writing and the use and maintenance of various research instruments and equipment.

ENT 705—INSECT MORPHOLOGY—4 cr. (3 and 3)

ENT 755—MEDICAL AND VETERINARY ENTOMOLOGY—3 cr. (2 and 3)

ENT 768—INTRODUCTION TO RESEARCH—2 cr. (1 and 3)

ENT 808—TAXONOMY OF IMMATURE INSECTS—3 cr. (1 and 6)

ENT 809—RECENT ADVANCES IN ENTOMOLOGY I—1 cr. (1 and 0)

ENT 810—RECENT ADVANCES IN ENTOMOLOGY II—1 cr. (1 and 0)

ENT 856—MEDICAL ENTOMOLOGY—3 cr. (2 and 3)

ENT 860—PRINCIPLES OF INSECT CONTROL—3 cr. (3 and 0)

ENT 861—INSECT TOXICOLOGY—3 cr. (2 and 3)

ENT 862—INSECT PHYSIOLOGY—3 cr. (2 and 3)

ENT 863—SPECIAL PROBLEMS IN ENTOMOLOGY—3 to 6 cr.

ENT 890—RESEARCH TECHNIQUES IN AGRICULTURE—3 cr. (2 and 3)

ENT 891—RESEARCH—Credit to be arranged.

ENT 991—DOCTORAL RESEARCH—Credit to be arranged.

ENVIRONMENTAL HEALTH

Associate Professor: R. F. BORGMAN, *Program Director*

ENH 471—MAN AND HIS ENVIRONMENT—2 cr. (2 and 0)
The interactions of man with his environment will be surveyed. Health factors such as urbanization, population growth, pathogens, insects and other vectors, ionizing radiation, and toxic chemical residues will be emphasized. The effects of air, water, food, and solid waste contacts will be considered. *Prerequisite:* Permission of instructor.

ENH 472—ENVIRONMENTAL PLANNING AND CONTROL—2 cr. (2 and 0)
Application of planning and design to effective environmental control. Topics such as land use, water supply and treatment, waste water treatment and disposal, and solid waste disposal will be considered from the standpoint of control. Not intended for graduate students in Engineering. *Prerequisite:* Permission of the instructor.

ENH 771—MAN AND HIS ENVIRONMENT—2 cr. (2 and 0)

ENH 772—ENVIRONMENTAL PLANNING AND CONTROL—2 cr. (2 and 0)

ENH 871—ENVIRONMENTAL HEALTH—3 cr. (3 and 0)

ENH 893—ENVIRONMENTAL HEALTH SEMINAR I—1 cr. (1 and 0)

ENH 894—ENVIRONMENTAL HEALTH SEMINAR II—1 cr. (1 and 0)

ENVIRONMENTAL SYSTEMS ENGINEERING

Professors: J. F. ANDREWS, *Head;* J. H. AUSTIN

Associate Professor: A. R. ABERNATHY

Assistant Professors: B. C. DYSART, T. M. KEINATH

Lecturer: G. M. MCCALLUM

Adjunct Professor: W. M. SANDERS

ESE 743—ENVIRONMENTAL ENGINEERING CHEMISTRY I—2 cr. (2 and 0)

ESE 744—ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY I—2 cr. (0 and 6)

ESE 842—SANITARY ENGINEERING PROCESSES—3 cr. (3 and 0)

ESE 843—UNIT OPERATIONS OF SANITARY ENGINEERING—3 cr. (3 and 0)

ESE 846—POLLUTION OF THE AQUATIC ENVIRONMENT—3 cr. (2 and 3)

ESE 848—ENVIRONMENTAL ENGINEERING CHEMISTRY II—2 cr. (2 and 0)

ESE 849—ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY II—2 cr. (1 and 3)

ESE 851—UNIT OPERATIONS AND PROCESSES LABORATORY—2 cr. (1 and 3)

ESE 852—WATER AND WASTE TREATMENT SYSTEMS—2 cr. (1 and 3)

ESE 853—ADVANCED UNIT OPERATIONS AND PROCESSES—3 cr. (2 and 3)

ESE 854—WATER AND WASTE TRANSPORT SYSTEMS—3 cr. (3 and 0)

ESE 855—SOLID WASTES—3 cr. (3 and 0)

ESE 861—ENVIRONMENTAL SYSTEMS ENGINEERING SEMINAR—0 cr. (1 and 0)

ESE 873—RADIOLOGICAL HEALTH—3 cr. (2 and 3)

ESE 874—RADIOLOGICAL HEALTH ENGINEERING—3 cr. (2 and 3)

ESE 881—SPECIAL PROBLEMS—1 to 4 cr.

ESE 883—SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)

ESE 884—SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)

ESE 891—RESEARCH—1-6 cr.

ESE 991—DOCTORAL RESEARCH—1-18 cr.

EXPERIMENTAL STATISTICS

Professor: W. P. BYRD

Assistant Professors: W. E. JOHNSTON, C. B. LOADHOLT, J. S. LYTLE

EX ST 301—INTRODUCTORY STATISTICS—3 cr. (2 and 2), F, S, SS
Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. The role of statistics in interpreting research, and the general application of the methods are stressed.

EX ST 462—STATISTICS APPLIED TO ECONOMICS—3 cr. (3 and 0) S
A continuation of Ex St 301 with emphasis on statistical methods used in the collection, analysis, presentation and interpretation of economic data. Special attention is given to time series analysis, the construction of index numbers and the designing of samples for surveys in the social science fields. *Prerequisite:* Ex St 301.

EX ST 601—INTRODUCTORY STATISTICS—3 cr. (2 and 2)

EX ST 762—STATISTICS APPLIED TO ECONOMICS—3 cr. (3 and 0)

EX ST 801—STATISTICAL METHODS—4 cr. (3 and 3)

EX ST 803—REGRESSION AND LEAST SQUARES ANALYSIS—3 cr. (3 and 0)

Ex St 804—Sampling—3 cr. (3 and 0)

Ex St 805—Design and Analysis of Experiments—3 cr. (3 and 0)

FOOD SCIENCE

Professors: J. H. Mitchell, Jr., A. L. Shewfelt, W. P. Williams, *Head*
Assistant Professors: J. J. Jen, L. E. Vereen

Fd Sc 212—Man's Food Resources—2 cr. (2 and 0)
S, '71 and alternate years.

Food material resources with reference to quality preservation, processing, and nutritional requirements. The role of science and technology in the modern food industry is emphasized. The need for food standards and grades is explained, and the functions of regulatory agencies are discussed. *Prerequisite:* Bot 101.

Fd Sc 305—Dairy and Food Engineering—3 cr. (2 and 3) F, '70

A study of the basic engineering principles and their application to the dairy and food processing operations. The relationship between engineering principles and fundamentals of food processing is emphasized for the dairy and food technologist. Topics include material and energy balance, electricity and power, steam generation, refrigeration, transfer of heat, flow and mechanics of fluids, evaporation and distillation, strength of materials and kinetics of biological reactions.

Fd Sc 311—Food Processing—3 cr. (3 and 0)
F, '71 and alternate years.

Principles of food handling and processing by refrigerated storage, freezing, canning, fermentation, sugar concentration, and food additives. *Prerequisite:* Organic Chemistry and Physics.

Fd Sc 312—Food Processing—3 cr. (3 and 0)
S, '72 and alternate years.

Principles of dehydration. Unit processes and manufacturing methods used in the processing of cereal grains, dairy products, meats and fish, vegetable oils, beverages, and confectioneries. Importance of water supply and waste disposal in food manufacture. *Prerequisite:* Organic Chemistry and Physics.

Fd Sc 313—Food Processing Laboratory—1 cr. (0 and 3)
F, '71 and alternate years.

Laboratory exercises dealing with equipment and processes used in food manufacture. *Prerequisite:* Registration in Fd Sc 311.

Fd Sc 314—Food Processing Laboratory—1 cr. (0 and 3)
S, '72 and alternate years.

A continuation of Fd Sc 313. *Prerequisite:* Registration in Fd Sc 312.

Fd Sc 412—Food Quality Control—2 cr. (2 and 0) S, '71

A comprehensive treatment of the philosophy and organization of and the responsibility for food quality control function. Major emphasis is placed on principles, quality attributes, government and trade standards of identity and their development, acceptance sampling (inspection), recording and reporting, and production and inventory control.

Fd Sc 413—Biochemistry of Foods—2 cr. (2 and 0)
F, '71 and alternate years.
Biochemical and enzymatic phenomena in relation to the color, texture, flavor, and nutritive value of foods, changes in biochemical constituents as a result of food processing and storage. *Prerequisite:* Ch 310 or 423 or permission of instructor.

Fd Sc 414—Food Quality Control Laboratory—2 cr. (1 and 3) S, '71
Fundamental aspects of sensory techniques employed in the quality evaluation of food products. A study of laboratory methods employed in product evaluation and grading of processed foods. A concept of quality is formed through examination of various grades of each food product. Actual practice in the selection and operation of taste panels illustrate their use in the industry.

Fd Sc 415—Human Nutrition—2 cr. (2 and 0)
F, '71 and alternate years.
Characteristics and functions of basic food nutrients and how they are affected by food processing, preservation and storage methods. Pathways for the conversion of nutrients into living tissue will be examined. *Prerequisite:* Ch 310 or 423 or permission of instructor.

Fd Sc 416—Food Analysis—2 cr. (1 and 3)
S, '72 and alternate years.
Application of quantitative procedures to the analysis of food products. Procedures include solids, protein, carbohydrates, lipids, vitamins, fiber, pigments, and other components. *Prerequisite:* Quantitative analysis or permission of instructor.

Fd Sc 417—Seminar—1 cr. (1 and 0) F, '70
Literature research and oral presentation of current food science topics.

Fd Sc 418—Seminar—1 cr. (1 and 0) S, '71
Literature research and oral presentation of current food science topics.

Fd Sc 712—Food Quality Control—2 cr. (2 and 0)

Fd Sc 713—Biochemistry of Foods—2 cr. (2 and 0)

Fd Sc 714—Food Quality Control Laboratory—2 cr. (1 and 3)

Fd Sc 715—Human Nutrition—2 cr. (2 and 0)

Fd Sc 716—Food Analysis—2 cr. (1 and 3)

FORESTRY

Professors: R. M. Allen, B. M. Cool, K. Lehotsky, *Head;* J. R. Warner

Associate Professors: M. H. Bruner, W. H. D. McGregor, R. E. Schoenike, W. A. Shain

Assistant Professors: C. L. Lane, T. E. Wooten

For 101—Introduction to Forestry—1 cr. (1 and 0) F
An informative sketch of forestry, forests, and forestry tasks of the nation; education in career opportunities of foresters.

For 205—Dendrology—4 cr. (3 and 3) F
Identification and nomenclature of the principal forest trees of the United States; their geographical distribution and economic importance; identification of many forest shrubs and commonly planted exotics. *Prerequisite:* Bot 101.

For 206—Silvics—2 cr. (2 and 0) S
Growth factors influencing the establishment and development of forest trees and stands. *Prerequisite:* Bot 101, Ch 102.

For 251S—Silvics—2 cr. (Summer Camp) SS
Field studies of growth factors influencing the establishment and development of forest stands. *Prerequisite:* Agron 202, Bot 356, For 205, For 206.

For 252S—Forest Engineering—2 cr. (Summer Camp) SS
Field surveying, establishment of boundary lines, planning and construction of forest trails and roads. *Prerequisite:* CE 200, EG 105.

For 253S—Dendrometry—4 cr. (Summer Camp) SS
Elements of mensuration dealing with volume determination of standing and harvested trees as well as forest stands. *Prerequisite:* CE 200, EG 105, For 205.

For 254S—Forest Products—1 cr. (Summer Camp) SS
Field studies of logging methods and equipment; trips to selected wood-using industries. *Prerequisite:* For 205 or permission of instructor.

For 302—Dendrometry—3 cr. (2 and 3) S
Volume determination of trees, logs, and stands; statistical procedures applied to forest measurements. *Prerequisite:* Ex St 401 and Forestry Summer Camp.

For 304—Forest Economics—3 cr. (3 and 0) S
Economic problems and principles involved in the utilization of forest land and timber and in the distribution of forest products; cost analysis of integrated forest operations. *Prerequisite:* Econ 201.

For 306—Identification of Wood and Wood Fibers—1 cr. (0 and 3) S
Macroscopic and microscopic identification, properties, and uses of selected economically significant timbers. *Prerequisite:* Bot 101, Ch 102 or permission of instructor.

For 307—Elements of Forestry—3 cr. (2 and 3) F, S
A compendium of forestry subjects forming a foundation for the management and utilization of farm forests and especially those of South Carolina. *Prerequisite:* Bot 101 or permission of instructor.

For 308—Aerial Photographs in Forestry—3 cr. (2 and 3) S
Use of aerial photographs in forestry; elementary photographic measurements; aerial photo interpretations; mapping and timber estimating procedures. *Prerequisite:* CE 203 and Forestry Summer Camp or permission of instructor.

For 310—Silviculture—4 cr. (3 and 3) S
Maintenance, harvesting, natural and artificial regeneration of forest stands based on the interrelation of biotic characteristics of stands and their environment. *Prerequisite:* For 206 and Forestry Summer Camp.

For 401—Logging and Milling—4 cr. (2 and 6) F
Logging and milling methods and costs, their administration; analysis of logging and milling operations; seasoning, grading, and marketing of lumber. *Prerequisite:* Senior standing.

For 404—Management Plans—1 cr. (0 and 3) S
Analysis and assembling of factors entering into a forest working plan; drawing of maps corollary to forest regulation; preparation of management plans. *Prerequisite:* For 407.

For 406—Forest Policy and Administration—2 cr. (2 and 0) S
Development of public and private forest policy in the United States; administrative and executive tasks in forestry; principles of organization, personnel management, and budget. *Prerequisite:* Senior standing.

For 407—Forest Regulation—4 cr. (3 and 3) F
Correlation of production factors and yields of forests; normal and empirical forests; rotations and cutting cycles; regulation of cuts and growing stock in sustained yield management. *Prerequisite:* For 302, 310.

For 408—Forest Valuation—3 cr. (3 and 0) S
Capital investments in forestry and the returns derivable from them; valuation of land, timber, and other resources associated with forestry; appraisal of damage and stumpage values. *Prerequisite:* For 304, 407.

For 410—Forest Products—3 cr. (2 and 3) S
Primary forest products other than sawlogs, e.g., poles, pulpwood, veneer stock, excelsior; secondary forest products, e.g., naval stores, maple syrup, Christmas trees; utilization and marketing of forest products. *Prerequisite:* Phys 202 and Senior standing.

For 412—Forest Protection—2 cr. (2 and 0) S
Causative and control factors of forest fires; fire prevention and suppression. Protection of forest resources against damages caused by man and animals. *Prerequisite:* Senior standing.

For 421—Wood Properties I—3 cr. (2 and 3)
The formation of wood in forest trees; gross and minute characteristics of wood; defects in wood; variability in wood. *Prerequisite:* Bot 101, For 306 or permission of instructor.

For 422—Wood Properties II—3 cr. (2 and 3)
Wood in relation to moisture, heat, sound, light, and electricity; mechanical properties of wood; standard testing procedures for wood. *Prerequisite:* For 306 or permission of instructor.

For 602—Dendrometry—3 cr. (2 and 3)

For 604—Forest Economics—3 cr. (3 and 0)

For 606—Identification of Wood and Wood Fibers—1 cr. (0 and 3)

For 607—Elements of Forestry—3 cr. (2 and 3)

For 608—Aerial Photographs in Forestry—3 cr. (2 and 3)

For 610—Silviculture—4 cr. (3 and 3)

For 701—Logging and Milling—4 cr. (2 and 6)

For 704—Management Plans—1 cr. (0 and 3)

For 706—Forest Policy and Administration—2 cr. (2 and 0)

For 707—Forest Regulation—4 cr. (3 and 3)

For 708—Forest Valuation—3 cr. (3 and 0)

For 710—Forest Products—3 cr. (2 and 3)

For 712—Forest Protection—2 cr. (2 and 0)

For 801—Data Processing in Forestry Problems—3 cr. (2 and 3)

For 802—Dendrometry—3 cr. (2 and 3)

For 803—Photo-Interpretation—3 cr. (2 and 3)

For 804—Forest Economics—3 cr. (2 and 3)

For 805—Cost Studies in Harvesting and Processing—3 cr. (2 and 3)

For 806—Multiple Use Management—3 cr. (3 and 0)

For 807—Special Problems in Forestry—Credit to be arranged.

For 891—Research—Credit to be arranged.

FRENCH

Associate Professor: J. A. Dean

Assistant Professors: D. Y. Brannock,[*] R. R. McGregor, Jr., J. B. Macy, R. G. Robertson

Instructors: Irene A. Aiem, Mary J. Fazio, Dorothy F. Findlen, Germaine M. Lafitte, H. A. Lewis, Jo Ann McNatt, Elke M. Maron, A. G. Weymouth

Lecturer: R. H. McEntire

Fr 101—Elementary French—3 cr. (3 and 1)

A course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr 102—Elementary French—3 cr. (3 and 1)

A continuation of Fr 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

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[*] On leave.

Fr 151—French for Graduate Students—0 cr. (0 and 0)
An intensive program for graduate students preparing to take the reading examination in French. Some previous study of the language is helpful but not essential.

Fr 201—Intermediate French—3 cr. (3 and 1)
Attention to grammar, with conversation, composition and dictation continued from Fr 102, and the beginning of more serious reading of French prose in short stories or novels. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr 202—Intermediate French—3 cr. (3 and 0)
While attention is paid to writing and speaking French, more stress is laid on the rapid reading of more difficult French prose than in the earlier courses. *Prerequisite:* Fr 201.

Fr 303—Survey of French Literature I—3 cr. (3 and 0)
Literary movements and authors from the beginnings to the eighteenth century. Required of French majors. *Prerequisite:* Fr 201 and 202.

Fr 304—Survey of French Literature II—3 cr. (3 and 0)
Literary movements and authors of the nineteenth and twentieth centuries. Required of French majors. *Prerequisite:* Fr 201 and 202.

Fr 305—Conversational French—3 cr. (3 and 0)
Practice in the spoken language, with stress on vocabulary building, pronunciation, intonation, and comprehension; written work to increase accuracy. Assignments in the language laboratory. Required of French majors. *Prerequisite:* Fr 201 and 202.

Fr 306—Advanced Conversation and Composition—3 cr. (3 and 0)
A continuation of Fr 305, with additional emphasis on written composition. Required of French majors. *Prerequisite:* Fr 305.

Fr 403—Twentieth Century Prose—3 cr. (3 and 0)
The outstanding authors of the first half of the twentieth century: Proust, Gide, Mauriac, Saint-Exupéry, Sarte, Camus, and others. Reading of selected works, discussions, and reports. *Prerequisite:* Fr 303 and 304.

Fr 404—Twentieth Century Drama—3 cr. (3 and 0)
The French theater since 1900, with emphasis on the period after 1930. Readings, discussions, and reports. *Prerequisite:* Fr 303 and 304.

Fr 405—Nineteenth Century French Romanticism—3 cr. (3 and 0)
The romantic movement as expressed in the works of Chateaubriand, Hugo, Merimée, Vigny, Stendahl, Sand, and others. Readings, discussions, and reports. *Prerequisite:* Fr 303 and 304.

Fr 406—Nineteenth Century French Realism—3 cr. (3 and 0)
Realism as expressed in the works of Balzac, Flaubert, Daudet, Maupassant, Zola, and others. Selected works, discussions, and reports. *Prerequisite:* Fr 303 and 304.

Fr 407—Eighteenth Century French Literature—3 cr. (3 and 0)
The principal literary figures of the eighteenth century, with particular emphasis on Voltaire and Rousseau. Selected works, discussions, and reports. *Prerequisite:* Fr 303 and 304.

FR 408—SEVENTEENTH CENTURY FRENCH DRAMA—3 cr. (3 and 0)

The French classical drama, with emphasis on Corneille, Racine, and Molière. Selected works, discussions, and reports. *Prerequisite:* Fr 303 and 304.

GENETICS

Professor: C. M. JONES

Assistant Professor: J. D. MAXWELL

GEN 302—GENETICS—3 cr. (2 and 3) F, S, SS

A general coverage of the basic principles of genetics. Examples illustrating the fundamentals of heredity and variation are given for plants and animals, including man. *Prerequisite:* Bot 101 and Zool 101, 103 or consent of instructor.

GEN 451—GENETICS—3 cr. (3 and 0) F

Methods and concepts in classical and modern genetics. Topics will include advanced studies of linkage; variations in chromosome number and structure; natural and induced mutations; extranuclear inheritance; experimental evolution; population, biochemical and medical genetics. Principles will be illustrated by examples from plants, animals (including man), and microorganisms. *Prerequisite:* Gen 302.

GEN 602—GENETICS—3 cr. (2 and 3)

GEN 751—GENETICS—3 cr. (3 and 0)

GEN 801—CYTOGENTICS—3 cr. (2 and 3)

GEOGRAPHY

Assistant Professor: H. F. MCMAINS

GEOG 201—INTRODUCTION TO GEOGRAPHY—3 cr. (3 and 0)

An introduction to the study of geography, including maps, the physical elements of the natural environment and their distribution, and world cultural patterns.

GEOG 301—ECONOMIC GEOGRAPHY—3 cr. (3 and 0)

The geographic conditions fundamental to the world's resources—agricultural, mineral, commercial and industrial, and the conditions which affect the utilization, marketing, consumption and strategic significance of these resources.

GEOG 302—POLITICAL GEOGRAPHY—3 cr. (3 and 0)

The geographic basis for and the geographic problems of the modern state; the relevance of geographical patterns to international affairs. *Prerequisite:* Junior standing or permission of the instructor.

GEOLOGY

Associate Professors: P. K. BIRKHEAD, V. S. GRIFFIN, JR.

Assistant Professors: G. M. HASELTON, R. D. HATCHER, JR., D. S. SNIPES

GEOL 201—PHYSICAL GEOLOGY—3 cr. (3 and 0)

A study of the minerals and rock which compose the earth's crust, their origins and transformations. Emphasis is placed upon geological processes, both internal and external, by which changes are produced on or in the earth. *Prerequisite:* Registration in Geol 203.

GEOL 203—PHYSICAL GEOLOGY LABORATORY—1 cr. (0 and 3)

Common minerals and rocks are studied. Instruction is also provided in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results. *Prerequisite:* Geol 201 or registration in Geol 201.

GEOL 204—HISTORICAL GEOLOGY—3 cr. (3 and 0)

Evolution, both organic and inorganic, is traced from the beginning of the record up through the ages to the present. *Prerequisite:* Geol 201 and registration in Geol 205 unless taken for elective credit.

GEOL 205—HISTORICAL GEOLOGY LABORATORY—1 cr. (0 and 3)

The student learns to recognize plants and animals which have left their record as fossils in the rocks of the earth's crust. Emphasis is placed upon geologic structures and the interpretation of geologic maps. Field trips are planned to demonstrate classroom concepts. *Prerequisite:* Geol 203 and simultaneous registration in Geol 204.

GEOL 306—MINERALOGY—3 cr. (2 and 3)

The student gains a working knowledge of crystallography and a comprehensive knowledge of determinative mineralogy. Identification of the minerals is based on their physical and chemical properties. *Prerequisite:* Geol 201 or 406.

GEOL 307—OPTICAL MINERALOGY—3 cr. (2 and 2)

The purpose of this course is to enable the student to identify minerals under the microscope on the basis of their optical properties. *Prerequisite:* Geol 306.

GEOL 309—PETROLOGY—3 cr. (2 and 3)

The genesis, evolution, and classification of rocks through lectures, laboratory exercises, and field trips. The occurrences, chemical relationships, and distribution of rock types are emphasized. *Prerequisite:* Geol 306.

GEOL 311—STRATIGRAPHY AND SEDIMENTATION—3 cr. (3 and 0)

The processes by which sediments are eroded, transported, and deposited (sedimentation), with major emphasis on relationships of the areal and time distribution of stratified rocks and their historical significances (stratigraphy). *Prerequisite:* Geol 201 and 204 or 406.

GEOL 402—STRUCTURAL GEOLOGY—3 cr. (2 and 2)

The diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. *Prerequisite:* Geol 201 and 204 or 406.

GEOL 403—INVERTEBRATE PALEONTOLOGY—3 cr. (2 and 3)

A study of life of past geologic ages, as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. *Prerequisite:* Geol 201 and 204 or permission of the instructor.

GEOL 404—ECONOMIC GEOLOGY—3 cr. (3 and 0)

This course concerns the description and classification of ore deposits and commercial non-metallic mineral deposits. The origin of mineral deposits and their occurrence is emphasized. Problem studies and field trips to nearby mines and quarries. *Prerequisite:* Geol 306.

Geol 405—Geomorphology—4 cr. (3 and 3)
A study of the surface features of the earth—their form, nature, origin, development, and the change they are undergoing. *Prerequisite:* Geol 201 and 203 or Geol 406 or permission of the instructor.

Geol 406—Engineering Geology—3 cr. (2 and 3)
This course is similar to Geol 201 except that progress is faster and emphasis is on the relationship of geology to engineering.

Geol 407—Glacial Geology—3 cr. (2 and 2)
Study of the types of glaciers, their distribution, nourishment and wastage. Continental and mountain glaciation, past and present, and the forms and deposits associated therewith. Ice contact forms, their significance and origins. *Prerequisite:* Geol 201 and 203, or Geol 406.

Geol 408—Geohydrology—3 cr. (3 and 0)
Study of the hydrologic cycle, aquifer characteristics, theory of ground water movement, mechanics of well flow, experimental methods, and subsurface mapping, *Prerequisite:* Geol 201 and 203, or Geol 406.

Geol 411—Research Problems—3 cr. (0 and 9)
A field, laboratory, or library study of an approved topic in geology. The topic would be one not normally covered in formal course offering, but may be an extension of a course. *Prerequisite:* Senior standing in geology or approval of the Department Head.

Geol 412—Research Problems—3 cr. (0 and 9)
A continuation of Geol 411.

Geol 606—Mineralogy—3 cr. (2 and 3)

Geol 607—Optical Mineralogy—3 cr. (2 and 2)

Geol 609—Petrology—3 cr. (2 and 3)

Geol 611—Stratigraphy and Sedimentation—3 cr. (3 and 0)

Geol 702—Structural Geology—3 cr. (2 and 2)

Geol 703—Invertebrate Paleontology—3 cr. (2 and 3)

Geol 704—Economic Geology—3 cr. (3 and 0)

Geol 705—Geomorphology—4 cr. (3 and 3)

Geol 707—Glacial Geology—3 cr. (2 and 2)

Geol 708—Geohydrology—3 cr. (3 and 0)

Geol 800—Earth Science I—3 cr. (2 and 3)

Geol 850—Earth Science II—3 cr. (2 and 3)

GERMAN

Assistant Professor: Patricia W. Wannamaker

Instructors: E. P. Arnold, Margaret S. Graham, H. L. Laws, Jr.

Ger 101—Elementary German—3 cr. (3 and 1)
A course for beginners in which, through conversation, composition and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language.

Three hours a week of classroom instruction and one hour a week in the language laboratory.

Ger 102—Elementary German—3 cr. (3 and 1)

A continuation of Ger 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

Ger 151—German for Graduate Students—0 cr. (0 and 0)

An intensive program for graduate students preparing to take the reading examination in German.

Ger 201—Intermediate German—3 cr. (3 and 1)

A short review of grammar, with conversation, composition and dictation continued from Ger 102, and the beginning of more serious reading of German prose in short stories or novels. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Ger 202—Intermediate German—3 cr. (3 and 0)

While attention is paid to writing and speaking German, more stress is laid on the rapid reading of more difficult German prose than in the earlier courses. *Prerequisite:* Ger 201.

Ger 251—Scientific German—3 cr. (3 and 0)

An alternate course to Ger 202; readings in general science and some review of grammar and syntax. *Prerequisite:* Ger 201.

Ger 303—Survey of German Literature I—3 cr. (3 and 0)

Literary movements and authors from the beginnings through romanticism, with emphasis upon Goethe and his contemporaries. Required of German majors. *Prerequisite:* Ger 201 and 202.

Ger 304—Survey of German Literature II—3 cr. (3 and 0)

Literary movements and authors from the end of romanticism to the present. Required of German majors. *Prerequisite:* Ger 201 and 202.

Ger 305—Conversational German—3 cr. (3 and 0)

Practice in the spoken language, with emphasis on vocabulary, pronunciation, and comprehension; written exercises for accuracy; assignments in the language laboratory. Required of German majors. *Prerequisite:* Ger 202 or 251.

Ger 306—Advanced Conversation and Composition—3 cr. (3 and 0)

Continuation of Ger 305 with additional emphasis on written composition. Required of German majors. *Prerequisite:* Ger 305.

Ger 403—Nineteenth Century German Literature—3 cr. (3 and 0)

Selected works of Heine, Hebbel, Grillparzer, Keller, Meyer, Hauptmann, Schnitzler, and Hofmannsthal. Readings, discussions, and reports. *Prerequisite:* Ger 303 and 304.

Ger 404—20th Century German Literature—3 cr. (3 and 0)

Selected works from authors of the twentieth century. *Prerequisite:* Ger 303 and 304.

Ger 405—The Age of Goethe—3 cr. (3 and 0)

The development of German literature during Goethe's lifetime, 1749-1832; Aufklärung, Sturm und Drang, Klassik, Romantik. *Prerequisite:* Ger 303, 304.

GER 406—FAUST—3 cr. (3 and 0)
An intensive reading of Goethe's masterpiece accompanied by extensive critical research. *Prerequisite:* Ger 303 and 304.

HISTORY

Professors: C. W. BOLEN, R. S. LAMBERT, E. M. LANDER, JR.

Associate Professor: VIRGINIA O. BARDSLEY *

Assistant Professors: H. D. ADAMS, J. L. ARBENA, J. W. BARNHILL, RUBY S. DAVIS, C. A. GRUBB, PATRICIA K. HILL, R. P. LEEMHUIS, H. F. MCMAINS, RAMETH R. OWENS, J. V. REEL, JR., W. F. STEIRER, JR., D. P. SULEIMAN

Instructors: S. M. APPELL, BETTINA K. BEER, J. R. BEER, A. D. MCCLARE, ANN R. RUSSELL, R. L. SAUNDERS, JR., A. VIGLIONE

Lecturer: ELIZABETH M. HAW

HIST 101—AMERICAN HISTORY—3 cr. (3 and 0)
The political, economic and social development of the American people from the period of discovery to the end of Reconstruction.

HIST H101—AMERICAN HISTORY—3 cr. (3 and 0)
Same as Hist 101 except that this honors section is open to students only by invitation.

HIST 102—AMERICAN HISTORY—3 cr. (3 and 0)
The political, economic and social development of the American people from the end of Reconstruction to the present.

HIST H102—AMERICAN HISTORY—3 cr. (3 and 0)
Continuation of Hist H101.

HIST 104—WESTERN CIVILIZATION—3 cr. (3 and 0)
A survey of the history of the modern world and the forces which have shaped its political, economic, and social institutions. (Not open to those who have passed Hist 204.)

HIST H104—WESTERN CIVILIZATION—3 cr. (3 and 0)
Same as Hist 104 except that this honors section is open to students only by invitation.

HIST 203—HISTORY OF CIVILIZATION—3 cr. (3 and 0)
The political, economic and social movements of Western Civilization from ancient times to 1660.

HIST H203—HISTORY OF CIVILIZATION—3 cr. (3 and 0)
Same as Hist 203 except that this honors section is open to students only by invitation.

HIST 204—HISTORY OF CIVILIZATION—3 cr. (3 and 0)
The political, economic and social movements of Western Civilization from 1660 to the present. (Not open to those who have passed Hist 104.)

HIST 301—HISTORY OF THE UNITED STATES SINCE 1865—3 cr. (3 and 0)
An advanced study of the political, social, and economic development of the United States since the end of the Civil War. *Prerequisite:* Junior standing. Not open to students who have completed Hist 102.

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* On leave.

HIST 306—AMERICAN ECONOMIC DEVELOPMENT—3 cr. (3 and 0)

The history of the economic development of the United States from 1492 to the present with emphasis on agriculture, transportation, banking, commerce, economic policies of the national government, and particularly the industrial revolutions. *Prerequisite:* Hist 101 and 102.

HIST 307—RECENT U. S. DIPLOMATIC HISTORY—3 cr. (3 and 0)

The history of American foreign policy from the late 19th century to the present, showing the rise of America's world interests and gradual involvement in global affairs. Emphasis is placed on the role of public opinion in foreign policy. Not open to students who have taken Hist 413. *Prerequisite:* Hist 101, 102.

HIST 313—HISTORY OF SOUTH CAROLINA—3 cr. (3 and 0)

The political, economic and social development of South Carolina from 1670 up to the present. *Prerequisite:* Junior standing.

HIST 314—HISTORY OF THE SOUTH—3 cr. (3 and 0)

Origins and development of political, economic, and cultural institutions of the South from the Colonial period to the present; and the role of the South in the nation's development. (Formerly Hist 403.)

HIST 315—BLACK HISTORY IN AMERICA—3 cr. (3 and 0)

This course is an effort to define and understand the relationship of Black Americans with White Americans within American society after 1619. *Prerequisite:* Permission of the instructor.

HIST 331—PRE-MODERN HISTORY OF EAST ASIA—3 cr. (3 and 0)

A survey of the history of China and Japan from earliest times to the arrival of Europeans in the sixteenth century. *Prerequisite:* Hist 102 or 204.

HIST 332—MODERNIZATION OF EAST ASIA—3 cr. (3 and 0)

A survey of the history of China and Japan from the Sixteenth Century to the present, with emphasis on the impact of Western culture. *Prerequisite:* Hist 102 or 104.

HIST 340—INDIGENOUS AND COLONIAL LATIN AMERICA—3 cr. (3 and 0)

An introduction to the geography of the region; structure and accomplishments of pre-Columbian societies; Iberian background to overseas expansion; conquest and settlement of the New World; political, economic, and social patterns in the colonial era leading to the Wars of Independence. *Prerequisite:* Junior standing or permission of the instructor.

HIST 341—MEXICO, CENTRAL AMERICA, AND THE CARIBBEAN SINCE 1800—3 cr. (3 and 0)

An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 342—SOUTH AMERICA SINCE 1800—3 cr. (3 and 0)

An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

Hist 361—History of England to 1603—3 cr. (3 and 0)
The history of England to 1603. *Prerequisite:* Junior standing. (Formerly Hist 308.)

Hist 363—History of England to 1603—3 cr. (3 and 0)
A continuation of History 361. *Prerequisite:* Junior standing. (Formerly Hist 309.)

Hist 371—Ancient Civilization—3 cr. (3 and 0)
A survey of the history of the Near East, Greece, and Rome to A.D. 476. *Prerequisite:* Hist 203, 204. (Formerly Hist 310.)

Hist 386—History of Russia—3 cr. (3 and 0)
A survey of the history of Russia from earliest times to the present. (Formerly Hist 312.)

Hist 410—History of Colonial America—3 cr. (3 and 0)
The development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards, and the philosophy of, the American revolution. *Prerequisite:* Hist 101, 102.

Hist 411—United States, 1783-1850—3 cr. (3 and 0)
The formation and growing pains of the new nation through the Federal and Middle periods of its history, with emphasis on economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism. *Prerequisite:* Hist 101, 102.

Hist 412—United States, 1850-1900—3 cr. (3 and 0)
A course dealing with the background causes of developments during, and broad problems after, the Civil War in American history. *Prerequisite:* Hist 101, 102.

Hist 413—United States History Since 1900—3 cr. (3 and 0)
The history of the United States from 1900 to the present. *Prerequisite:* Hist 101, 102.

Hist 473—Medieval History—3 cr. (3 and 0)
A survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life. *Prerequisite:* Hist 203, 204. (Formerly Hist 402.)

Hist 475—The Renaissance—3 cr. (3 and 0)
An examination of the transitional period of European civilization (ca. 1300-1500) with emphasis on institutional, cultural, and intellectual developments. *Prerequisite:* Hist 203, 204. (Formerly Hist 404.)

Hist 476—Early Modern Europe—3 cr. (3 and 0)
The evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion, and growth of nation-states. The study will include intellectual advances and the beginnings of European expansion overseas. *Prerequisite:* Hist 203, 204.

Hist 477—Absolutism and the Age of Reason—3 cr. (3 and 0)
A study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the

question of French hegemony, and the synthesis of the eighteenth century Enlightenment. *Prerequisite:* Hist 203, 204.

Hist 479—Europe, 1789-1850—3 cr. (3 and 0)
A history of Europe from the outbreak of the French Revolutions through the Revolutions of 1848, with emphasis on the conflict between the forces of change and those of conservatism within the states and in Europe in general. (Formerly Hist 356.) *Prerequisite:* Hist 203, 204.

Hist 480—Europe, 1850-1914—3 cr. (3 and 0)
A history of Europe from the mid-nineteenth century to the outbreak of the First World War, with emphasis on the social, economic and political development of the European states and the forces of nationalism, imperialism, and liberalism. (Formerly Hist 357.) *Prerequisite:* Hist 203, 204.

Hist 482—International Relations Since 1914—3 cr. (3 and 0)
The great powers and world politics since 1914. (Formerly Hist 408.) *Prerequisite:* Hist 203, 204.

Hist 483—Europe in the Twentieth Century—3 cr. (3 and 0)
A study of the political, economic, and social institutions of the European peoples from 1914 to the present. Attention will be given to the world wars and to the collapse of the European state-system.

Hist 484—European Intellectual History Since 1789—3 cr. (3 and 0)
A survey, based upon representative works, of the major intellectual currents in Europe from the Enlightenment to the present. *Prerequisite:* Hist 203, 204.

Hist 499—Studies in History—3 cr. (3 and 0)
An attempt to integrate the students' knowledge and understanding of the field of history by lectures, discussions, and readings on the broad themes of history and their relevance to particular periods and geographical areas. Required of all history majors. *Prerequisite:* Hist 101, 102, 203, 204, and permission of the history adviser.

Hist 710—History of Colonial America—3 cr. (3 and 0)

Hist 711—United States, 1783-1850—3 cr. (3 and 0)

Hist 712—United States, 1850-1900—3 cr. (3 and 0)

Hist 713—United States Since 1900—3 cr. (3 and 0)

Hist 773—Medieval History—3 cr. (3 and 0)
(Formerly Hist 702)

Hist 775—The Renaissance—3 cr. (3 and 0)
(Formerly Hist 704)

Hist 779—Europe, 1789-1850—3 cr. (3 and 0)
(Formerly Hist 356)

Hist 780—Europe, 1850-1914—3 cr. (3 and 0)
(Formerly Hist 357)

Hist 782—International Relations Since 1914—3 cr. (3 and 0)

Hist 807—United States Diplomatic History Since 1877—3 cr. (3 and 0)

Hist 811—Introduction to Historical Research—3 cr. (3 and 0)

Hist 812—United States Historiography—3 cr. (3 and 0)

HIST 813—MEDIEVAL HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 814—MODERN EUROPEAN HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 824—SEMINAR IN THE AMERICAN SOUTH—3 cr. (3 and 0)

HIST 825—SEMINAR IN THE CIVIL WAR AND RECONSTRUCTION—3 cr. (3 and 0)

HIST 861—SEMINAR IN MEDIEVAL ENGLAND—3 cr. (3 and 0)

HIST 862—SEMINAR IN MEDIEVAL ENGLAND TO 1485—3 cr. (3 and 0)

HIST 863—SEMINAR IN TUDOR ENGLAND—3 cr. (3 and 0)

HIST 864—SEMINAR IN STUART ENGLAND—3 cr. (3 and 0)

HIST 865—SEMINAR IN MODERN ENGLAND SINCE 1715—3 cr. (3 and 0)

HIST 866—SEMINAR IN MODERN ENGLAND SINCE 1715—3 cr. (3 and 0)

HIST 891—RESEARCH—Credit to be arranged.

HORTICULTURE

Professors: L. O. VAN BLARICOM, W. L. OGLE, T. L. SENN, *Head*

Associate Professors: J. R. HAUN, H. J. SEFICK, E. T. SIMS, JR., B. J. SKELTON, G. E. STEMBRIDGE, F. W. THODE

Assistant Professors: J. P. FULMER, C. R. JOHNSON, W. S. JORDAN, F. B. LEDEBOER

HORT 201—GENERAL HORTICULTURE—3 cr. (2 and 2) F, S
A working knowledge of the fundamental plant processes is developed, showing the influence of light, temperature, water and nutrients upon vegetative growth and reproduction of horticultural plants. Production practices, harvesting, storage and marketing of the principal fruit, vegetable and ornamental crops are discussed with demonstrations and practice in greenhouse and orchard. *Prerequisite:* Bot 101 and Ch 101.

HORT 302—PRINCIPLES OF VEGETABLE PRODUCTION—3 cr. (2 and 3) F
The general principles of vegetable growing and handling. Phases receiving special emphasis are economic importance, producing areas, management practices, plant forcing, cultural practices, irrigation, quality factors, harvesting, grading, packing, storage, market inspection, transportation, refrigeration, exhibition and seed production. *Prerequisite:* Hort 201.

HORT 303—PLANT MATERIALS I—3 cr. (2 and 2) F
Woody, ornamental plants and their aesthetic and functional uses in landscape developments. The study covers habit of growth, ultimate size, texture effect, period of bloom, color, and cultural requirements.

HORT 304—PLANT MATERIALS II—3 cr. (2 and 3) S
Herbaceous, ornamental plants which are commonly used as garden flowers. This study covers habit of growth, size, period of bloom, color and cultural requirements.

HORT 305—PLANT PROPAGATION—3 cr. (2 and 3) F
Methods of propagation; time, manner and material for making cuttings; temperature and media for rooting cuttings or ornamental trees, shrubs and flowering plants; propagating structures, soils and fertilizers. Practical instruction given in field and greenhouse. *Prerequisite:* Hort 201.

Hort 308—Landscape Design—3 cr. (2 and 3) S
Landscape planning of residential and public properties in order to achieve best use and most enjoyment from a given piece of ground. *Prerequisite:* Hort 303.

Hort 310—Floriculture—3 cr. (2 and 2) S
Greenhouse production of commercial flower crops; soils; fertilizers; greenhouse diseases and insects; flower crops to be grown on benches and as pot plants; marketing and costs of production. *Prerequisite:* Hort 201.

Hort 352—Commercial Pomology—3 cr. (2 and 3) F
Fruit bud formation, rest period and water relations of fruit plants, soils, fruit setting; orchard soil management and responses of various fruits to fertilizers; principles of pruning, effect of climatic differences, freezing of tissues and means of avoiding injury; harvesting, transportation and storage. *Prerequisite:* Hort 201.

Hort 405—Nut Tree Culture—2 cr. (2 and 0) F, '70 and alternate years.
The production, harvesting and marketing of the principal nut crops with emphasis on the pecan. *Prerequisite:* Hort 201.

Hort 406—Nursery Technology—3 cr. (2 and 3) S
Principles and techniques in handling nursery crops. *Prerequisite:* Hort 303 and Hort 305.

Hort 407—Landscape Design—3 cr. (2 and 3) F
The first half of this course is a study of trees, shrubs, vines and ground covers used in landscape planting. Attention is given to cultural requirements, growth habits, period of bloom, texture and fall color. The second half of the course is devoted to landscape planning for small residential properties.

Hort 408—Floral Design and Retail Marketing—3 cr. (2 and 2) F
Studies of the retail flower business with relation to financing, floor plan, equipment, personnel, supplies, salesmanship, advertising, and other important areas. Floral designing for the retail trade will include corsage construction, wreath construction, funeral and wedding designs as well as home arrangements.

Hort 409—Seminar—1 cr. (1 and 0) F
Recent research work on various phases of horticulture, methods of conducting investigations, and preparation of report of investigations.

Hort 410—Seminar—1 cr. (1 and 0) S
A continuation of Hort 409.

Hort 412—Turf Management—3 cr. (2 and 3) F
The identification, use, culture, and maintenance of turf grasses. *Prerequisite:* Junior standing.

Hort 451—Small Fruit Culture—3 cr. (2 and 3) S
Varieties, soils, sites, culture, fertilizers, harvesting and preparation for marketing of grapes, strawberries, dewberries, blackberries, raspberries and other small fruits. *Prerequisite:* Hort 201.

Hort 456—Vegetable Crops—3 cr. (3 and 0) S, '71 and alternate years.
The principles and practices employed in the commercial growing and marketing of vegetable crops. Emphasis is placed on temperature requirements, plant characteristics, varieties, soils, fertilizers, weed control, harvesting and preparation for market.

HORT 460—PROBLEMS IN LANDSCAPING DESIGN—5 cr. (3 and 6) F
Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans, costs; further study of materials used; original problems; field study. *Prerequisite:* Hort 308 or 407.

HORT 464—POST HARVEST HORTICULTURE—3 cr. (2 and 3) F
The handling of fruits, vegetables, and ornamental crops after harvesting. Subjects include spoilage problems, hydrocooling, common and cold storage of crops, packaging and processing procedures.

HORT 468—INTRODUCTION TO RESEARCH—2 cr. (1 and 3) S
Principles, developments and changes in research methods related to certain fields of agricultural research. The students obtain practice in experimental techniques, scientific writing and the use and maintenance of various research instruments and equipment. *Prerequisite:* Senior standing.

HORT 608—LANDSCAPE DESIGN—3 cr. (2 and 3)

HORT 610—FLORICULTURE—3 cr. (2 and 2)

HORT 652—COMMERCIAL POMOLOGY—3 cr. (2 and 3)

HORT 705—NUT TREE CULTURE—2 cr. (2 and 0)

HORT 706—NURSERY TECHNOLOGY—3 cr. (2 and 3)

HORT 707—LANDSCAPE DESIGN—3 cr. (2 and 3)

HORT 712—TURF MANAGEMENT—3 cr. (2 and 3)

HORT 751—SMALL FRUIT CULTURE—3 cr. (2 and 3)

HORT 756—VEGETABLE CROPS—3 cr. (3 and 0)

HORT 760—PROBLEMS IN LANDSCAPE DESIGN—5 cr. (3 and 6)

HORT 764—POST HARVEST HORTICULTURE—3 cr. (2 and 3)

HORT 768—INTRODUCTION TO RESEARCH—2 cr. (1 and 3)

HORT 801—PROBLEMS IN SMALL FRUIT PRODUCTION—3 cr. (3 and 0)

HORT 802—RESEARCH SYSTEMS IN HORTICULTURE—3 cr. (2 and 3)

HORT 803—EXPERIMENTAL OLERICULTURE—3 cr. (3 and 0)

HORT 804—SCIENTIFIC ADVANCES IN ORNAMENTAL HORTICULTURE—3 cr. (3 an 0)

HORT 805—PHYSICOCHEMICAL PROCEDURES FOR DETERMINING QUALITY IN HORTICULTURAL CROPS—3 cr. (2 and 3)

HORT 806—POST-HARVEST PHYSIOLOGY AND HANDLING OF HORTICULTURE CROPS—3 cr. (3 and 0)

HORT 807—POMOLOGY—3 cr. (3 and 0)

HORT 808—SPECIAL INVESTIGATIONS IN HORTICULTURE—2 cr. (2 and 0)

HORT 809—SEMINAR I—1 cr. (1 and 0)

HORT 810—SEMINAR II—1 cr. (1 and 0)

HORT 811—QUANTITATIVE EXPOSITION OF PLANT DEVELOPMENT—2 cr. (1 and 3)

Hort 891—Research—Credit to be arranged.

Hort 991—Doctoral Research—Credit to be arranged.

HOSPITAL AND HEALTH SERVICES ADMINISTRATION

Professor: F. A. Burtner

Associate Professor: C. O. Shuler

Visiting Lecturer: R. E. Toomey

H Adm 308—Hospital and Health Services Administration—3 cr. (3 and 0)

An introduction to the organization and operation of modern American hospitals, separate clinics and public health services. Included will be legal status, organizational pecularities, and specific legislation effecting such agencies. *Prerequisite:* Junior standing.

H Adm 410—Hospital Internship—3 cr. (0 and 9)

The student will spend nine hours per week on a specified program of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. The course will be specifically outlined along with the amount of time the student will spend in each phase or department of the hospital. Student progress will be constantly monitored by University faculty and hospital staff. *Prerequisite:* H Adm 308.

H Adm 710—Hospital Internship—3 cr. (0 and 9)

The student will spend approximately nine hours per week following a detailed plan of study consisting of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. Progress will be periodically evaluated by University and hospital staffs.

H Adm 800—The Function and Organization of Hospitals and Health Services Administration—3 cr. (3 and 0)

An overview of organization, function, place in the community and society of hospitals, individual health services and public health services. This course in conjunction with an administrative internship will prepare the student for major responsibilities in the area of health service administration.

HUMANITIES

Hum 201—Introduction to the Humanities—3 cr. (3 and 0)

A general introduction to humanistic studies, stressing the interrelatedness of various humanistic disciplines. Such fields as art, architecture, music, literature, philosophy, and drama will be considered as they interact with, support, and develop each other in various cultural settings.

Hum 202—Introduction to the Humanities—3 cr. (3 and 0)

A continuation of Hum 201. *Prerequisite:* Hum 201.

Hum 203—Critical Judgment of the Cinema—3 cr. (3 and 0)

The historical development of the aims and techniques of the cinema; the theory of cinematography, its artistic values, and its critical standards. *Prerequisite:* Sophomore standing.

INDUSTRIAL EDUCATION

Professor: A. F. Newton, *Head*

Associate Professor: D. E. Maurer

Assistant Professors: F. A. Bosdell, P. C. Caley, J. P. Crouch, M. S. Hahn, H. E. Morgan, Jr., W. E. West

Instructor: J. J. Rohrbach

In Ed 101—Introduction to Industrial Education—1 cr. (1 and 0)
An introduction to the field of Industrial Education in terms of the underlying philosophies, the aims and goals, and the specific objectives of each of the Industrial Education options.

In Ed 102—Woodworking I—2 cr. (1 and 3)
A study of wood, its properties and the requisite skills necessary for understanding the use of wood in our technological way of life. *Prerequisite:* In Ed 101.

In Ed 202—Woodworking II—2 cr. (1 and 3)
A continuation of In Ed 102 in the study of wood, its properties, skills in machine and tool use with wood, project design, project costs and finishing processes necessary for teachers of industrial subjects. *Prerequisite:* In Ed 102.

In Ed 203—Basic Metal Processes—3 cr. (1 and 6)
Material separating, forming and combining practices in the metals industries, through the study of basic casting, welding and sheet metal techniques. *Prerequisite:* In Ed 101.

In Ed 204—Graphic Arts—3 cr. (1 and 6)
Major emphasis is placed on the basic principles underlying the graphic arts. Major areas of study include general photography, graphic layout and design, process photography, offset lithography, screen processing printing, and bindery. Modern industrial applications are stressed throughout. *Prerequisite:* In Ed 101.

In Ed 205—Power Technology—3 cr. (2 and 2)
A study of power in terms of energy sources, and the generation, transmission and utilization of power. Emphasis is placed on the development of insights and understandings of the scientific and operational principles involved in the production, transmission, and utilization of power. *Prerequisite:* In Ed 101.

In Ed 220—Recreational and Avocational Crafts—3 cr. (2 and 3)
Provides exploratory experiences in the performance of a variety of arts and crafts activities, and encourages the development of an understanding of the purpose of arts and crafts in the comprehensive recreational program.

In Ed 302—Dwelling Materials and Construction Methods—2 cr. (1 and 2)
This course is designed as an introduction to the commonly used building materials and the methods of combining them in present day construction. *Prerequisite:* In Ed 102.

In Ed 303—Electricity—3 cr. (1 and 6)
A laboratory inquiry into the theory and application of components, circuits, and instrumentation associated within the realm of electricity. *Prerequisite:* In Ed 101.

In Ed 304—Photographic Techniques—3 cr. (1 and 6)
Emphasis is placed on applications of black and white and color photography as activities for vocation and avocation. Sufficient laboratory experiences are provided to assure confidence in the use of photographic techniques. The tools and materials of image preparation are also used in conjunction with several graphic reproduction processes to enrich the effectiveness of visual presentations. Problems encountered in action, portrait, still-life, and character study photography are considered.

In Ed 305—Machining Practices—3 cr. (1 and 6)
Basic practical shop experiences on the lathe, drill press, milling machine and shaper. Benchwork, measuring tools, theory and demonstrations related to a survey of fundamental machining practices. *Prerequisite:* In Ed 101.

In Ed 310—Methods of Trade Teaching—3 cr. (3 and 0)
This course is designed to give basic instruction to beginning teachers in trade work. Psychological factors of learning; individual differences; methods of teaching subjects; the special methods used in teaching skills; grading of students and keeping of proper records and reports. (Offered in Summer Sessions only.)

In Ed 312—Metal Processes in the General Shop—3 cr. (3 and 0)
Major emphasis is placed on planning and development of projects in wrought iron, sheet metal, art metal, metal spinning, welding, heat treating and other aspects of metal work that fit into a general shop program. (Offered in Summer Sessions only.)

In Ed 313—Arts and Crafts—3 cr. (2 and 3)
Emphasis on knowledge and skills in the industrial crafts by lecture, discussion and laboratory experiences. Stress is placed on several crafts basic to industrial production and popularity. Laboratory experience is required in at least four craft areas with an additional experience in one minor craft.

In Ed 314—Basic Electronics—3 cr. (1 and 6)
Basic principles of electronics as applied in radio, television, and automatic controls involving vacuum tubes, semiconductors, integrated circuits, and other electronic devices and materials. *Prerequisite:* In Ed 303.

In Ed 315—Construction Practices—3 cr. (3 and 0)
This course is a study of industrial practices commonly employed in the construction industry. Included will be the use of brick, tile, concrete, metal, wood, and other construction materials. (Offered in Summer Sessions only.)

In Ed 316—Plastics and Plastic Processes in the General Shop—3 cr. (3 and 0)
The industrial, commercial and personal uses of plastics are discussed and demonstrated. In addition, the kinds of plastics, their properties, and special uses are studied. (Offered in Summer Sessions only.)

In Ed 318—Industrial Technology Techniques—3 cr. (3 and 0)
Major emphasis is placed on casting, stamping and forming processes, forging and extrusion processes, machining processes, metal spraying or metallurgy, blast cutting, heating and case hardening, assembly processes, bending, finishing processes, inspection gaging. (Offered in Summer Sessions only.)

In Ed 320—Machine Woodworking—2 cr. (1 and 3)

Basic characteristics of woodcutting, shaping, and finishing operations by use of machinery and auxiliary tools. Includes project work. *Prerequisite:* Junior standing. (Not for Industrial Education Students.)

In Ed 325—Industrial Organizations and People—3 cr. (3 and 0)

A study of the relationships of personnel to the kinds of tasks they are asked to perform in industrial situations and the ways such situations affect workers. Emphasis is placed on methods of personnel, organization, evaluation, working conditions, and safety.

In Ed 333—Design—3 cr. (2 and 3)

The study of the principles of form and design elements in two or three dimensions as related to products in the several industrial arts areas. Lectures and laboratory projects stress creativity in the use of materials in reaching design solutions and in developing a personal design philosophy. Limited market and engineering research is conducted along with the study of significant figures in the field. *Prerequisite:* Basic courses in laboratory methods.

In Ed 350—Industrial Cooperative Experience—6 cr.

A full-time work experience program in industry for industrial vocational-technical education degree candidates. The student, under the cooperative supervision of the University instructor and an industrial supervisor, is placed in industry to receive planned experiences in the technical specialty which he is preparing to teach. The University instructor will coordinate placement, supervision, and evaluation of the student. The course is offered during the summer only and students are required to register with the instructor one semester prior to the summer in which he plans to enroll. *Prerequisite:* Junior standing in the industrial vocational-technical education program and approval of the instructor.

In Ed 372—Arts and Crafts for the Elementary Child—3 cr. (2 and 3)

Provides the elementary teacher with an opportunity to develop skills and knowledge in the use of a variety of media suitable for integrating the study of industry and industrial technology into the usual classroom procedures.

In Ed 402—Directed Teaching—6 cr. (0 and 18)

Supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for securing experience in teaching industrial subjects. *Prerequisite:* In Ed 416, 425, and grade-point ratio required for graduation.

In Ed 405—Course Organization and Evaluation—3 cr. (3 and 0)

Problems, techniques and procedures in the preparation, selection and organization of subject matter for instructional purposes. Methods, techniques and preparation of materials used in the evaluation of student achievement in industrial education subjects.

In Ed 408—Training Programs in Industry—3 cr. (3 and 0)

Basic concepts of supervision, administration, and management of training programs. Emphasis on determining training requirements, planning, directing, and evaluating training programs.

IN ED 416—DESIGN AND OPERATION OF INDUSTRIAL EDUCATION LABORATORIES—3 cr. (2 and 2)

This course deals with laboratory design requirements of unit laboratories as well as multi-activity laboratories. Selection and procurement of tools and equipment, budgeting management and the coordination of activities in the laboratory are considered. *Prerequisite:* In Ed 313.

IN ED 421—VOCATIONAL COOPERATIVE PROGRAMS—2 cr. (2 and 0)

A study of the developments, objectives and principles of industrial cooperative training programs. Emphasis is on the organization, promotion, and management of programs in this area of vocational education.

IN ED 422—HISTORY AND PHILOSOPHY OF INDUSTRIAL AND VOCATIONAL EDUCATION—3 cr. (3 and 0)

A study of industrial and vocational education programs with the intent of developing a sound individual philosophy of industrial and vocational education. General topics covered: history; local, state, and federal legislation; types of vocational-technical programs; professional organizations; manpower utilization, vocational guidance, and training; industry, labor, and school relationships.

IN ED 425—TEACHING INDUSTRIAL SUBJECTS—3 cr. (3 and 0)

Effective methods and techniques of teaching industrial subjects. Emphasis is given to class organization, preparation of lesson outlines, and audio-visual aids. *Prerequisite:* Ed 335.

IN ED 432—ADVANCED WOODWORKING—2 cr. (1 and 3)

An advanced consideration of machine methods and developments, materials, quality factors, and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 102, In Ed 202.

IN ED 435—ADVANCED WELDING—2 cr. (1 and 3)

An advanced consideration of studies originated in In Ed 203, new theories and developments in welding technology. Inspection trips, written and oral reports. *Prerequisite:* In Ed 203.

IN ED 436—ADVANCED MATERIAL FORMING—2 cr. (1 and 3)

Advanced consideration of studies initiated in In Ed 203, development and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 203.

IN ED 438—ADVANCED MACHINING—2 cr. (0 and 6)

Advanced experiences in the set-up, operation and maintenance of machine tools and equipment. Project and product design. Study and reports of recent machining technological developments. *Prerequisite:* In Ed 305.

IN ED 440—ADVANCED TECHNIQUES OF THE GRAPHIC ARTS—3 cr. (1 and 6)

Students selecting to pursue the area of graphic arts will gain experience in the development of advanced techniques of layout and design; photographic copy preparation; cold type composition; line, halftone, duotone, and special effects photography, and advanced platemaking and pressmanship.

IN ED 441—COMPREHENSIVE GENERAL SHOP PRACTICES—2 cr. (2 and 0)

This course deals with the problems in the administration of the multiple activity programs in the comprehensive laboratory. Consideration and planning of multi-activity laboratory programs of instruction for the secondary schools is the major focus. *Prerequisite:* In Ed 313.

In Ed 442—Competency Testing in Vocational Subjects—3 cr. (3 and 0)

This course is especially designed for trade teachers who have assisted in making trade tests for S. C. Certification program. Teachers who expect to assist in making trade tests are also urged to enroll in this course. The course is devoted to revising present trade tests and developing tests in new fields. (Offered in Summer Sessions only.)

In Ed 444—Graphic Arts Production Control—3 cr. (2 and 3)

A study of commercial and industrial printing control. Emphasis is placed upon considerations for decision making in the areas of process and equipment selection, capital investment, and plant layout. Other topics include production flow, cost analysis, personnel supervision and training, and recent developments as they affect production. *Prerequisites:* In Ed 204, In Ed 440, and permission of the instructor.

In Ed 450—Industrial Cooperative Experience—6 cr.

Continuation of In Ed 350. Summer only. *Prerequisite:* Senior standing, In Ed 350, and approval of the instructor.

In Ed 451—Special Projects—3 cr. (3 and 0)

The student is assigned a project in accordance with his needs and capabilities. Projects are either experimental, theoretical or developmental and cover subjects not thoroughly covered in other courses.

In Ed 496—Public Relations—3 cr. (3 and 0)

This course emphasizes the techniques and methods of effective public and industrial relations which contribute to understanding and cooperation of labor, business, professional, educational, and industrial groups.

In Ed 705—Course Organization and Evaluation—3 cr. (3 and 0)

In Ed 708—Training Programs in Industry—3 cr. (3 and 0)

In Ed 716—Design and Operation of Industrial Education Laboratories—3 cr. (2 and 2)

In Ed 722—History and Philosophy of Industrial and Vocational Education—3 cr. (3 and 0)

In Ed 725—Teaching Industrial Subjects—3 cr. (3 and 0)

In Ed 732—Advanced Woodworking—2 cr. (1 and 3)

In Ed 735—Advanced Welding—2 cr. (1 and 3)

In Ed 736—Advanced Material Forming—2 cr. (1 and 3)

In Ed 738—Advanced Machining—2 cr. (1 and 3)

In Ed 740—Advanced Techniques of the Graphic Arts—3 cr. (1 and 6)

In Ed 741—Comprehensive General Shop Practices—2 cr. (2 and 0)

In Ed 744—Graphic Arts Production Control—3 cr. (2 and 3)

In Ed 796—Public Relations—3 cr. (3 and 0)

In Ed 815—Seminar in Industrial Education—1 cr. (1 and 0)

In Ed 820—Recent Process Developments—3 cr. (3 and 0)

In Ed 840—School Shop Design—3 cr. (3 and 0)

In Ed 845—Curriculum Development in Industrial Education—3 cr. (3 and 0)

In Ed 860—Curriculum Planning and Development in Industrial Arts—3 cr. (3 and 0)

In Ed 861—Administration and Supervision of Vocational Education—3 cr. (3 and 0)

In Ed 865—American Industries—3 cr. (3 and 0)

In Ed 891—Research in Industrial Education— Credit to be arranged.

In Ed 895—Special Problems I—3 cr. (3 and 0)

In Ed 896—Special Problems II—3 cr. (3 and 0)

INDUSTRIAL ENGINEERING

Professor: E. Laitala, *Head*

Associate Professor: J. H. Couch

IE 301—Process Planning I—3 cr. (2 and 3)
Study of methods of conversion of raw materials into finished products. Emphasis is from the viewpoint of management and control of manufacturing operations. Includes basic terminology, interpretation and use of engineering plans, impact of production volume. This course will examine various manufacturing processes including material removal, casting, joining and forming of materials, and associated measurement techniques. *Prerequisite:* EG 103 or 109 and Phys 122.

IE 303—Job Evaluation and Wage Incentives—3 cr. (3 and 0)
Job description, specification, and classification. Systems employed for establishing relative ranks of jobs. Basic wage and salary determination. Wage incentive methods. *Prerequisite:* IE 307, 410 or consent of instructor.

IE 304—Methods and Standards—3 cr. (2 and 3)
Fundamentals relating to work methods design and analysis. Includes study of techniques necessary for determining efficient work methods. Work measurement as a basis for control of costs and scheduling. *Prerequisite:* Junior standing.

IE 306—Process Planning II—3 cr. (2 and 3)
Study of recent process developments and impact on planning and control of manufacturing operations. Numerical control of machines, computer-aided design, zero defects program, and others. Special laboratory investigations, and value engineering project. *Prerequisite:* IE 301.

IE 307—Survey of Engineering—3 cr. (3 and 0)
An examination of engineering in terms of types of fundamentals employed, governing parameters, basic plans, basic engineering functions, organization of divided engineering efforts, and measures of performance. Offered to students not majoring in engineering. *Prerequisite:* Phys 202 and Junior standing.

IE 403—Process Planning III—3 cr. (3 and 0)
Continuation of IE 306; study of latest process developments. *Prerequisite:* IE 306.

IE 404—Engineering Economic Analysis—3 cr. (3 and 0)
Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness. *Prerequisite:* Senior standing in Engineering or consent of instructor.

IE 405—Plant Layout and Material Handling—3 cr. (2 and 3)
Fundamentals underlying the planning of factory layout for new products and increases in production volume. Layout by product and process. Scale model, template, and other planning techniques. Materials handling analysis and equipment decisions. *Prerequisite:* IE 301 and IM 408 or consent of instructor.

IE 407—Industrial Application of Statistics—3 cr. (2 and 3)
Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability analysis, and machine interference. *Prerequisite:* Math 208 and Math 313.

IE 408—Plant Design—2 cr. (1 and 3)
Integration of unit operations into a total production system. Study of analytical procedures for determining layout of production and other facilities, line balance, manner in which operations shall be linked or material moved between them. Creation and analysis of alternative designs. *Prerequisite:* IE 304 and Senior standing.

IE 410—Engineering and Organization—3 cr. (3 and 0)
The nature of industrial enterprise in terms of purpose, organization structure, governing criteria, responsibilities and relationships of various functional groups. Project engineering and organization. Analysis and coordination of engineering functions as foundation for engineering management.

IE 411—Work Flow Systems and Control—3 cr. (3 and 0)
Fundamentals underlying the determination of production capacity requirements, economic lot sizes, and the regulating of flow and storage of materials to, within and from the production system. Elements of forecasting, determination of materials requirements, scheduling, inventory control, etc. Consideration of data processing methods. *Prerequisite:* Math 313 and IE 410 or consent of instructor.

IE 412—Seminar—1 cr. (1 and 0)
Library search and oral reports covering recent technological developments in the field of industrial engineering. Consideration of professional responsibilities and post graduation plans. A major term paper is required. *Prerequisite:* Senior standing in Industrial Engineering.

IE 413—Seminar—1 cr. (1 and 0)
Continuation of IE 412. *Prerequisite:* IE 412.

IE 416—Project Scheduling—3 cr. (3 and 0)
Basic planning and plans underlying the design and control of work flow systems for diverse engineering projects. Systems design of schedule plans

including design function, operations, materials procurement, facilities, equipment, etc. Fundamentals underlying critical path (PERT, C.P.M.) and data processing methods. *Prerequisite:* Senior standing in Engineering.

IE 704—ENGINEERING ECONOMIC ANALYSIS—3 cr. (3 and 0)

IE 707—INDUSTRIAL APPLICATION OF STATISTICS—3 cr. (2 and 3)

IE 710—ENGINEERING AND ORGANIZATION—3 cr. (3 and 0)

IE 711—WORK FLOW SYSTEMS AND CONTROL—3 cr. (3 and 0)

IE 716—PROJECT SCHEDULING—3 cr. (3 and 0)

INDUSTRIAL MANAGEMENT

Professors: C. C. DAVIS, B. J. TODD, C. H. WHITEHURST, JR., *Head*

Associate Professors: E. A. LAROCHE, F. R. GRAY, S. O. PARK,* J. L. RICHARDSON, C. O. SHULER, J. M. WANNAMAKER, C. V. WRAY

Assistant Professors: SUSAN H. BROWN, C. A. BURDEN, T. H. GUNTER, JR., G. D. RIGGS, J. A. TURNER

Instructors: E. E. BURCH, J. E. FRIESE

Visiting Lecturer: R. E. TOOMEY

IM 100—INTRODUCTION TO INDUSTRIAL MANAGEMENT—0 cr. (1 and 0)
A series of lectures by University and industry speakers in which the role of the industrial manager in society is examined and explained. Particular emphasis is placed on orienting the student to understanding the manager's function in a market system economy.

IM 201—INTRODUCTION TO INDUSTRIAL MANAGEMENT—3 cr. (3 and 0)
An introductory survey of management's role as a fourth factor of economic production.

IM 299—COMPUTER PROGRAMMING I—1 cr. (0 and 3)
An elementary operating course primarily designed to familiarize the student with the various capabilities of electronic computers. A demonstrated ability to write basic programs applicable to management areas is required. *Prerequisite:* Permission of instructor.

IM 304—QUALITY CONTROL—3 cr. (3 and 0)
Basic control techniques in the field of industrial production, inspection and experimentation. Various sampling, control and inspection problems are studied with special reference to practical applications. Underlying theory, assumptions and limitations are presented. *Prerequisite:* Math 313.

IM 306—CORPORATION FINANCE—3 cr. (3 and 0)
The organization and operation of corporations with emphasis on the nature and influences of the various sources of funds. *Prerequisite:* Junior standing.

IM 307—PERSONNEL MANAGEMENT—3 cr. (3 and 0)
An introductory course dealing with the principles and policies governing present day employee-employer relationships. Attention directed to methods of electing, training, placing, and promoting of employees to develop sound personnel techniques. *Prerequisite:* Junior standing.

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* On leave.

IM 312—Commercial Law—3 cr. (3 and 0)
An introduction to business law with primary attention given to contracts, agency, negotiable instruments and sales. *Prerequisite:* Junior standing.

IM 313—Commercial Law—3 cr. (3 and 0)
Continuation of IM 312 with emphasis on business organization, personal and real property, estates and bankruptcy and security services.

IM 322—Legal Environment of Business—3 cr. (3 and 0)
A comprehensive study of the development of governmental regulation of business including both state and national regulations. Attention is given to the constitutional source and limitation of power in both governments; specific areas in which the governments have acted (production, labor, combinations, prices, etc.) and the regulations that have been imposed in these areas; and the scope of the administrative process.

IM 401—Marketing Analysis—3 cr. (3 and 0)
An examination of the activities involved in the flow of goods and services from producer to consumer. Stressed will be the application of quantitative techniques for predicting sales and evaluating alternative promotional strategies. *Prerequisite:* Senior standing in IM or permission of instructor.

IM 402—Operations Planning and Control—3 cr. (3 and 0)
The application of modern statistical and mathematical techniques to the planning and control of industrial operations. Emphasis will be placed on applications in forecasting, inventory, production scheduling and control, equipment selection and replacement, maintenance and materials handling. *Prerequisite:* IM 304 and senior standing.

IM 403—Special Problems—2 cr. (2 and 0)
Each student will plan and develop a research project related to the field of management. *Prerequisite:* Senior standing in Industrial Management.

IM 404—Managerial Economics—3 cr. (3 and 0)
The objective of this course is to bridge the gap between theory and managerial practices. Its stress is on the use of tools of economic analysis in classifying problems, in organizing and evaluating information, and in comparing alternative courses of action. *Prerequisite:* Mgt Sc 311, or permission of instructor.

IM 405—Economics of Transportation—3 cr. (3 and 0)
History and structure of transportation systems of the United States; the nature of transportation costs and rates. Transportation systems as factors in industrial location. Government policy towards transportation. *Prerequisite:* Senior standing and permission of the instructor.

IM 406—Theory of Industrial Location—3 cr. (3 and 0)
A theoretical study of the general factors which determine plant location in a capitalist society. Particular attention is paid to the selection of location sites by small nonbranch manufacturing plants. A comparison of location theory and actual location patterns is stressed. *Prerequisite:* Senior standing and permission of instructor.

IM 407—Directed Research—1 cr. (1 and 0)
Each student will plan and develop a research project related to the field of management. *Prerequisite:* Senior standing in Industrial Management.

IM 408—Work Simplification and Standardization—3 cr. (2 and 3)
Principles and practices of motion and time as it is applied to industry. Emphasis is given to its application and its influence on methods, material handling, plant layout, and time study procedures.

IM 409—Management Simulation—0-1 cr. (0 and 3)
Practice in managerial decision-making under simulated competitive industry conditions. Guidance is furnishesd by the staff member administering the requirement. The model is designed to derive maximum benefit from previous courses in economics, econometrics and statistics. *Prerequisite:* Senior standing and permission of instructor.

IM 410—Marketing Research I—1 cr. (1 and 0)
A directed research course oriented toward those students interested in a career in marketing.

IM 411—Marketing Research—2 cr. (2 and 0)
A directed research course oriented toward those students interested in a career in marketing.

IM 412—Marketing Analysis II—3 cr. (3 and 0)
A continuation of Marketing Analysis, IM 401. *Prerequisite:* IM 401 or permission of instructor.

IM 413—Marketing Communications—3 cr. (3 and 0)
The vital role of advertising and public relations in today's marketing strategy is examined. Promotional mixes will be designed so as to be a blend of the markets, media, and messages by which corporate communications are maintained with buyers. Communications theory is explored and then the communications process is analyzed with emphasis on its effect upon the flow of goods and services to the consuming public. *Prerequisite:* IM 401.

IM 415—Managerial Decision Making—3 cr. (3 and 0)
Management problems and methods involved in the operation of manufacturing institutions, including location, equipment investment, organization structure, and budgets. Attention is given primarily to the above areas by the use of the case method. Emphasis on oral and written communication. *Prerequisite:* Permission of instructor.

IM 416—Management of Human Resources—3 cr. (3 and 0)
A course designed to orient the student toward recent developments in enlightened uses of human resources with emphasis on procurement, training, development, rewarding and retention of such resources. *Prerequisite:* Permission of instructor.

IM 417—Manufacturing Logistics—3 cr. (3 and 0)
A study of more advanced manufacturing and production techniques including predetermined motion time data systems, micromotion study analysis, work sampling or ratio delay studies, zero defects, materials handling techniques, machine interference, time study formula construction, machinery and equipment replacement calculations, economic lot size determination, development and use of standard data, cost reduction programs, operator training methods, charting of time study data, problems of machinery and equipment layout, and developing of complex time standards. *Prerequisite:* IM 408 or permission of instructor.

IM 499—COMPUTER PROGRAMMING II—1 cr. (0 and 3)
Each student will complete a research project relating to the accomplishment of some management function in which a computer program is now—or is expected to be—of cardinal importance. *Prerequisite:* IM 299 or equivalent.

IM 701—MARKETING ANALYSIS I—3 cr. (3 and 0)

IM 702—OPERATIONS PLANNING AND CONTROL—3 cr. (3 and 0)

IM 704—MANAGERIAL ECONOMICS—3 cr. (3 and 0)

IM 705—ECONOMICS OF TRANSPORTATION—3 cr. (3 and 0)

IM 706—THEORY OF INDUSTRIAL LOCATION—3 cr. (3 and 0)

IM 708—WORK SIMPLIFICATION AND STANDARDIZATION—3 cr. (2 and 3)

IM 712—MARKETING ANALYSIS II—3 cr. (3 and 0)

IM 715—MANAGERIAL DECISION MAKING—3 cr. (3 and 0)

IM 717—MANUFACTURING LOGISTICS—3 cr. (3 and 0)

IM 800—MANAGEMENT SIMULATION—1 cr. (0 and 3)

IM 801—QUANTITATIVE ECONOMIC ANALYSIS—3 cr. (3 and 0)

IM 802—FINANCE—3 cr. (3 and 0)

IM 803—OPERATIONS MANAGEMENT—3 cr. (3 and 0)

IM 804—MANAGERIAL POLICY—3 cr. (3 and 0)

IM 805—QUALITY CONTROL—3 cr. (3 and 0)

IM 811—ADVANCED MARKETING ANALYSIS—3 cr. (3 and 0)

IM 816—MANAGEMENT OF HUMAN RESOURCES—3 cr. (3 and 0)

IM 891—THESIS—3 cr.

MANAGEMENT SCIENCE

Professors: B. J. TODD, C. H. WHITEHURST
Associate Professors: E. A. LAROCHE, S. O. PARK [*]
Assistant Professors: G. D. RIGGS, C. L. DYER

MGT SC 311—INTRODUCTION TO ECONOMETRICS—3 cr. (3 and 0)
An introduction to economic measurement. Emphasis is placed upon the mathematical formulation of economic theory, the application of calculus to economic theory, and the application of statistics with particular emphasis on the use of regression analysis in economics. Elementary econometric models are introduced. *Prerequisite:* Math 313 and Econ 314.

MGT SC 413—MANAGEMENT SCIENCE I—3 cr. (3 and 0)
The role and uses of management science techniques in decision making in business and industry; the problems of internal operation of a business enterprise in static and dynamic settings under conditions of certainty, risk and uncertainty. Deterministic models will be emphasized, and topics include classical optimization, marginal analysis, programming, the transportation problem, allocation and assignment, the game thory. Attention will also be given

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[*] On leave.

to input-output, network analysis, and decision theory. *Prerequisite:* Consent of instructor.

MGT SC 414—STATISTICAL ANALYSIS—3 cr. (3 and 0)
This course is designed to provide the student with sufficient understanding of modern statistical methods to make judicious application of statistics in management decision making. Emphasis is placed on the proper design, analysis and interpretation of planned experiences in internal operations. Topics include single factor through fractional factorial experiments, response surface methodology and evolutionary operations. *Prerequisite:* Math 313 or equivalent.

MGT SC 611—INTRODUCTION TO ECONOMETRICS—3 cr. (3 and 0)

MGT SC 713—MANAGEMENT SCIENCE I—3 cr. (3 and 0)

MGT SC 714—STATISTICAL ANALYSIS—3 cr. (3 and 0)

MGT SC 806—REGIONAL SCIENCE METHODS—3 cr. (3 and 0)

MGT SC 807—ECONOMETRIC METHODS I—3 cr. (3 and 0)

MGT SC 808—ECONOMETRIC METHODS II—3 cr. (3 and 0)

MGT SC 812—MANAGEMENT SCIENCE II—3 cr. (3 and 0)

MATERIALS ENGINEERING

Associate Professors: M. J. EITEL, S. F. HULBERT, *Program Coordinator;* J. S. WOLF

Assistant Professors: D. A. VENKATU, F. A. YOUNG

MATE 301—INTRODUCTION TO METALLURGICAL ENGINEERING—3 cr. (3 and 0)
An introduction to the structure and properties of engineering materials. Topics included are bonding in solids, mechanical behavior, equilibrium and non-equilibrium behavior of mixtures and alloys, material-environment interaction, selection of materials for engineering uses, and analysis of material failures. Emphasis is placed on metals and polymers. *Prerequisite:* Junior standing in engineering, Ch 102, Phys 221.

MATE 302—MATERIALS ENGINEERING LABORATORY—2 cr. (1 and 3)
Laboratory practice in the determination and analysis of the properties of engineering materials. Topics included are specimen selection and preparation, microscopy, photography, temperature measurement, thermal analysis, and mechanical testing. *Prerequisite:* MatE 301 or CrE 310.

MATE 307—INTRODUCTION TO POLYMER ENGINEERING—3 cr. (3 and 0)
An introduction to the materials science of organic polymers. The structures for many polymer types are surveyed and correlated with macroscopically observable characteristics. The properties of pure and coexisting polymer phases are defined, and thermally dependent phase transitions are discussed. Further considerations are devoted to swelling and solubility phenomena. *Prerequisite:* MatE 301 or CrE 310.

MATE 312—MATERIALS ENGINEERING THERMODYNAMICS—3 cr. (3 and 0)
An introduction to the thermodynamics of materials with special emphasis on metallic systems. Topics included are atomic and crystalline properties of metals, solid solutions and intermetallic compounds, the thermodynamic laws and their relation to solution theory and phase equilibria, and applications of

the above to the phase equilibria in unary, binary, and ternary metallic systems with special regard to microstructural evolution. *Prerequisite:* MatE 301 or CrE 310.

MatE 405—Physical Metallurgy I—3 cr. (3 and 0)

A comprehensive treatment of electron theory, lattice defects, diffusion, solutions and phase equilibria, phase transformations, creep and fracture applied to metals and simple alloys, with emphasis on structure-property relationships. *Prerequisite:* Mat 301 or CrE 310

MatE 406—Physical Metallurgy II—3 cr. (3 and 0)

A continuation of MatE 405. *Prerequisite:* MatE 405.

MatE 408—Principles of Polymer Science I—3 cr. (3 and 0)

Various polymerization methods are surveyed, and the possibilities are examined for bringing about surface modifications. The polymerizations kinetics of addition polymerization are dealt with in detail. Further considerations are concerned with viscoelastic phenomena and with various experimental methods for analyzing and testing polymeric samples. *Prerequisite:* MatE 307.

MatE 409—Principles of Polymer Science II—3 cr. (3 and 0)

An introduction to the properties of solutions containing polymeric solutes. Quantitative treatments are presented for characterizing polymer samples by experimentation with dilute solutions. The significant properties of polyelectrolytes will be discussed, and various applications of these systems will be considered. *Prerequisite:* MatE 408.

MatE 411—Materials Engineering Kinetics—3 cr. (3 and 0)

An introduction to the important rate processes in solid materials. Topics included are homogeneous and heterogeneous phase transitions, solidification and other nucleation processes, recrystallization and grain growth, and sintering reactions. Emphasis is placed upon the effects of these phenomena on the properties of engineering materials. *Prerequisite:* A course in thermodynamics.

MatE 421—Mechanical Metallurgy—3 cr. (3 and 0)

A comprehensive treatment of the concepts of the atomic and microstructural processes which govern the mechanical behavior of metals, alloys, metal oxides, and composite structures. The theories of plastic deformation, creep, and fatigue are applied to metal working processses and the selection of materials for loadbearing applications. *Prerequisite:* MatE 301 or CrE 310.

MatE 450—Special Topics in Materials Engineering—1-3 cr. (1-3 and 0)

A comprehensive study of a topic of current interest in the field of materials engineering. May be taken for credit more than one time. *Prerequisite:* Consent of instructor.

MatE 451—Corrosion of Materials—3 cr. (3 and 0)

An introduction to the aqueous and gaseous corrosion of metals and alloys. Topics included are ion migration in solid and liquid phases, Pourbaix diagrams, theory and application of corrosion rate measurements, and special corrosion process as they apply to metal degradation and failure. *Prerequisite:* A course in thermodynamics.

MatE 720—Mechanical Properties of Materials—3 cr. (3 and 0)

MatE 800—Seminar in Materials Research—1 cr .(1 and 0)

MatE 802—Research Techniques in Physical Metallurgy—3 cr. (2 and 3)

MatE 805—Physical Metallurgy I—3 cr. (3 and 0)

MatE 806—Physical Metallurgy II—3 cr. (3 and 0)

MatE 807—Physical Properties of Polymers—3 cr. (3 and 0)

MatE 808—Mechanical Properties of Polymers—3 cr. (3 and 0)

MatE 810—Diffusion in Solids—3 cr. (3 and 0)

MatE 811—Kinetics of Heterogeneous Reactions—3 cr. (3 and 0)

MatE 812—Metallurgical Thermodynamics—3 cr. (3 and 0)

MatE 815—Application of Heterogeneous Equilibria—3 cr. (3 and 0)

MatE 820—Deformation Mechanisms in Solids—3 cr. (3 and 0)

MatE 821—Strength Mechanisms in Solids—3 cr. (3 and 0)

MatE 831—Quantum Theory of Metals I—3 cr. (3 and 0)

MatE 841—Sintering and Related Phenomena—3 cr. (3 and 0)

MatE 850—Special Topics in Materials Engineering—3 cr. (3 and 0)

MatE 851—Oxidation of Metals and Alloys—3 cr. (3 and 0)

MatE 891—Research—Credit to be arranged

MatE 991—Doctoral Research—Credit to be arranged

MATHEMATICS

Professors: C. V. Aucoin, A. T. Hind, Jr., J. W. Kenelly, *Head;* A. Sobczyk, P. W. Zehna

Associate Professors: K. Alam, M. C. Bell, A. K. Bose, J. V. Brawley, Jr., J. W. Brown, F. M. Cholewinski, E. C. Coker, Jr., J. L. Flatt, J. C. Harden, Jr., W. R. Hare, Jr., R. E. Haymond, C. E. Kirkwood, Jr., J. W. LaGrone, Renu C. Laskar, S. M. Lukawecki, M. C. Palmer, E. Park, T. G. Proctor, L. A. Rife, W. H. Ruckle, K. Seo, E. L. Stanley, J. R. Sullivan, K. T. Wallenius

Assistant Professors: A. S. Cover, Sue K. Dunkle, R. E. Fennell, J. D. Fulton, D. R. LaTorre, J. K. Luedeman, J. H. Nicholson, M. F. O'Reilly, B. J. Prochaska, J. A. Reneke, B. C. Russell

Instructors: Eugenie V. Bartmess, Louise G. Fulmer, L. S. Haw, Jeuel G. LaTorre

Math 100—College Algebra—2 cr. (5 and 0)

Required of all freshmen who fail to make a satisfactory grade on the Mathematics Test, Level I (Standard). An intensified review of high school algebra and the topics listed under Math 103. Students enrolled in Math 100 must receive a passing grade in this course before they are eligible to enroll in any other mathematics course. Math 100 may be substituted for Math 103.

Math 101—Mathematical Analysis I—3 cr. (3 and 0)

Topics include: intuitive calculus (differentiation and integration), continu-methods, probability spaces, conditional probabilities and discrete random variables. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard) or consent of the instructor.

MATH 102—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)

Topics include: intuitive calculus (differentiation and Integration), continuous random variables, normal distribution and other probability densities. *Prerequisite:* Math 101.

MATH 103—COLLEGE ALGEBRA—2 cr. (3 and 0)

Algebraic processes, functions, equations, inequalities, mathematical induction, theory of equations, determinants, and logarithms. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard).

MATH 104—TRIGONOMETRY—2 cr. (3 and 0)

Trigonometric functions, equations, identities, and solution of triangles. Logarithms and complex numbers. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard).

MATH 106—CALCULUS OF ONE VARIABLE—4 cr. (5 and 0)

Topics include: real numbers, analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, techniques of integration, and approximations. *Prerequisite:* Math 103, 104, or a satisfactory score on the Mathematics Test Level I (Standard).

MATH H106—CALCULUS OF ONE VARIABLE—4 cr. (5 and 0)

Same as Math 106 except that this honors section is open to students only by invitation.

MATH 115—CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS I—3 cr. (3 and 0)

Logic, sets, and the properties of the counting numbers, numeration systems.

MATH 116—CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS II—3 cr. (3 and 0)

A continuation of Math 115. Subtraction, properties of the integers, elementary number theory, rational number system, real number system. *Prerequisite:* Math 115.

MATH 203—ELEMENTARY STATISTICAL INFERENCE—3 cr. (3 and 0)

A survey course in fundamental statistical principles with applications to social sciences and other fields. The development of the course will assume knowledge of finite probability. Major topics include: empirical frequency distributions, computation of descriptive statistics, basic statistical inference including estimation and z, t, and F tests, regression and correlation analysis, contingency tables, analysis of variance. *Prerequisite:* Math 102 or a 3-credit course in finite probability.

MATH 205—CALCULUS AND LINEAR ALGEBRA—4 cr. (5 and 0)

Topics include: matrices and vectors, transformation and matrices, representations of linear transformations and the topics in calculus are infinite series, limits, differentiation and integration. *Prerequisite:* Math 106.

MATH H205—CALCULUS AND LINEAR ALGEBRA—4 cr. (5 and 0)

Same as Math 205 except this honors section is open to students only by invitation.

MATH 206—CALCULUS OF SEVERAL VARIABLES—4 cr. (5 and 0)
Topics include: real valued functions of several variables, multiple integration, differential calculus of functions of several variables, applications, vector field theory. *Prerequisite:* Math 205.

MATH H206—CALCULUS OF SEVERAL VARIABLES—4 cr. (5 and 0)
Same as Math 206 except this honors section is open to students only by invitation.

MATH 207—MULTIPLE DIMENSION CALCULUS—3 cr. (3 and 0)
Principal topics include differential and integral calculus for functions of several variables, extreme values of functions, Lagrangian multipliers, differential equations and difference equations. Examples from the managerial and social sciences. *Prerequisite:* Math 205.

MATH 208—ENGINEERING MATHEMATICS I—4 cr. (5 and 0)
This course presents an introduction to the study of differential equations, linear algebra, complex variables, and the Laplace transforms. *Prerequisite:* Math 206.

MATH H208—ENGINEERING MATHEMATICS—4 cr. (5 and 0)
This course presents an introduction to the study of differential equations, linear algebra, complex variables, and the Laplace transforms. This honors section is open to students only by invitation.

MATH 215—ALGEBRA FOR ELEMENTARY SCHOOL TEACHERS—3 cr. (3 and 0)
Linear equations and linear inequalities in one variable, functions and graphs, systems of linear equations and linear inequalities, quadratic equations, complex number system. Finite number systems, algebraic structures.

MATH 216—GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS—3 cr. (3 and 0)
An informal treatment of the basic concepts of geometry.

MATH 295—FOUNDATION OF ANALYSIS—3 cr. (3 and 0)
An introduction to the language and use of symbolic logic and the properties of the real number system with applications to the calculus. *Prerequisite:* Math 205.

MATH 308—COLLEGE GEOMETRY—3 cr. (3 and 0)
Theorems and concepts more advanced than those of high school geometry. A treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Prerequisite:* Math 106.

MATH 309—ENGINEERING MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math 208. An introduction to Fourier Series, numerical methods, vector algebra, vector calculus, partial differential equations and certain special functions is given. *Prerequisite:* Math 208.

MATH H309—ENGINEERING MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math H208. An introduction to Fourier series, numerical methods, vector algebra, vector calculus, partial differential equations and certain special functions is given. This honors section is open to students only by invitation. *Prerequisite:* Math 208.

MATH 313—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)
Principal topics include: elementary probability theory, discrete and continuous random variables, expected values, normal distribution, chi-square distribution, t-distribution, F-distribution, test of hypothesis, point and interval estimation, curve fitting. *Prerequisite:* Math 206.

MATH H313—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)
Principal topics include: empirical distributions, random variables, probability space, normal distribution, chi-square distribution, T-distribution, F-distribution, test of hypothesis, estimation curve fitting. This honors section is open to students only by invitation. *Prerequisite:* Math 206.

MATH 402—THEORY OF PROBABILITY—3 cr. (3 and 0)
Principal topics include: combinatorial theory, probability axioms, random variables, expected values, special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. *Prerequisite:* Math 206.

MATH H402—THEORY OF PROBABILITY—3 cr. (3 and 0)
Principal topics include: combinatorial theory, random variables, correlation, conditional expectation, predictions, binomial distribution, poisson distribution, normal distribution law of large numbers, central limit theorem, elementary markov chains. This honors section is open to students only by invitation.

MATH 403—STATISTICAL INFERENCE—3 cr. (3 and 0)
Principal topics include: sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypothesis, likelihood ration methods, regression and correlation analysis, introduction to analysis of variance. *Prerequisite:* Math 402.

MATH H403—STATISTICAL INFERENCE—3 cr. (3 and 0)
Principal topics include: point estimation, linear hypothesis, correlation, regression, distribution free methods, sequential analysis. This honors section is open to students only by invitation.

MATH 404—INTRODUCTION TO STOCHASTIC PROCESSES—3 cr. (3 and 0)
Principal topics include—random variables, counting processes, stationary processes, ergodic processes, spectral distribution function, examples from scientific fields to indicate the use of stochastic processes in construction of models of physical and behavioral phenomena. *Prerequisite:* Math 402.

MATH 405—STATISTICAL THEORY AND METHODS II—3 cr. (3 and 0)
Principal topics include contingency tables, goodness of fit, rank-sum tests. Kolmogorov-Smirnov tests, analysis of variance, factoral experimentation, applications to reliability and life testing, applications to quality assurance. *Prerequisite:* Math 313.

MATH 407—PARTIAL DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)
Partial differentiation and space geometry, origins of partial differential equations, linear and non-linear equations of the first order, Fourier series, linear equations of the second and higher orders. *Prerequisite:* Math 208.

MATH 408—TOPICS IN GEOMETRY—3 cr. (3 and 0)
An introduction to topics in special geometries which include non-Euclidean space concepts, such as projective geometry, finite geometries, and intuitive

elementary topology. A brief introduction to vector geometry. *Prerequisite:* Math 206.

MATH 409—STATISTICAL THEORY AND METHODS III—3 cr. (3 and 0)
A continuation of Math 405 with equal emphasis on both the mathematical foundations and practical applications of advanced statistical methods. Principal topics include: experimental designs, fractionally replicated experiments, multiple regression and response surface analysis, evolutionary operations, simultaneous inference, analysis of covariance, and time series analysis. *Prerequisite:* Math 405.

MATH 411—LINEAR ALGEBRA—3 cr. (3 and 0)
An introduction to the algebra of matrices, vector spaces, polynomials and linear transformations. *Prerequisite:* Math 206.

MATH 412—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)
An introduction to the concepts of algebra. Topics included are the number system; elementary theory of groups; rings, integral domains, and fields; matrices over a field; determinants and matrices; groups, rings, and ideals. *Prerequisite:* Math 206.

MATH H412—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)
An introduction to the concepts of algebra. Topics included are the number system; elementary theory of groups; rings, integral domains, and fields, matrices over a field; determinants and matrices; groups, rings and ideals. This honors section is open to students only by invitation. *Prerequisite:* Math 206.

MATH 413—MODERN ALGEBRA—3 cr. (3 and 0)
A continuation of Math 412.

MATH H413—MODERN ALGEBRA—3 cr. (3 and 0)
A continuation of Math H412, which is an introduction to the concepts of algebra. Topics included are the number system; elementary theory of groups, rings, integral domains, and fields; matrices over a field; determinants and matrices; groups, rings and ideals. This honors section is open to students only by invitation.

MATH 415—INTRODUCTION TO TOPOLOGY—3 cr. (3 and 0)
An introduction to point set topology; Hausdorff, regular and normal spaces; metric connected and compact spaces; continuous mappings and homeomorphisms. *Prerequisite:* Math 295.

MATH H415—INTRODUCTION TO TOPOLOGY—3 cr. (3 and 0)
Introduction to point set topology; Hausdorff, regular and normal spaces; metric connected and compact spaces; continuous mappings and homeomorphisms. This honors section is open to students only by invitation.

MATH 417—MATHEMATICS PROGRAMS—3 cr. (3 and 0)
Aspects of the new high school programs in mathematics. Open only to in-service teachers or students in the Mathematics Teacher Training Program. *Prerequisite:* Math 308; *corequisite:* Math 408.

MATH 422—MATHEMATICAL LOGIC—3 cr. (3 and 0)
A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Sufficient mathematical background.

MATH 424—FOUNDATIONS OF MATHEMATICS—3 cr. (3 and 0)
Naive set theory, cardinal and ordinal numbers, and axiom of choice and equivalents. A study of the set theoretic fundamentals of abstract mathematics.

MATH 425—INTERMEDIATE DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)
Second order linear differential equations, regular singular points, Bessel, Legendre and hypergeometric functions, general linear equations, existence and uniqueness theorems, plane autonomous systems and phase plane concepts, Sturm-Louville systems. *Corequisite:* Advanced Calculus.

MATH 429—NUMERICAL ANALYSIS I—3 cr. (3 and 0)
Difference and summation calculus, round off noise, finite Fourier series, polynomial approximation, numerical solution of differential equations. *Prerequisite:* Math 453.

MATH 435—COMPLEX VARIABLES—3 cr. (3 and 0)
Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping and residue theory. Schwartz-Christoffel transformation. *Prerequisite:* Math 453.

MATH H435—COMPLEX VARIABLES—3 cr. (3 and 0)
Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping and residue theory. Schwartz-Christoffel transformation. This honors section is open to students only by invitation.

MATH 452—LINEAR PROGRAMMING—3 cr. (3 and 0)
An introduction to linear programming, using elementary matrix algebra and the theory of convex polygons. Applications to managerial problems, operations research, economic behavior, the theory of games and military strategy are considered. *Prerequisite:* Math 206 or permission of the instructor.

MATH 453—ADVANCED CALCULUS I—3 cr. (3 and 0)
Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Prerequisite:* Math 208 and Junior standing.

MATH 454—ADVANCED CALCULUS II—3 cr. (3 and 0)
A continuation of Math 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals.

MATH 457—APPLIED MATHEMATICS I—cr. (3 and 0)
Determinants and matrices, review of differential equations, finite differences, Fourier series and integrals, Laplace transformations, a large selection of applications. *Prerequisite:* Math 208.

MATH 458—APPLIED MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math 457. Partial differential equations, Bessel functions and Legendre polynomials, analytic functions of complex variables, infinite series in a complex plane, the theory of residues, conformal mapping. *Prerequisite:* Math 457.

MATH 463—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)
Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation,

functions of several real variables, implicit function theory. *Prerequisite:* Math 295.

MATH 464—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Math 463.

MATH H464—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Math H463. This honors section is open to students only by invitation.

MATH 471—APPLIED STATISTICAL DECISION THEORY—3 cr. (3 and 0)
An introduction to statistical decision theory emphasising the Bayesian approach. Behavioral axioms, characterizing the "Rational decision maker," lead to the laws of probability theory and utility theory. Topics include: axioms of subjective probability and utility, extensive and normal form analysis, likelihood principle, conjugate distributions. *Prerequisite:* Math 402.

MATH 473—INTRODUCTION TO NONLINEAR OPTIMIZATION—3 cr. (3 and 0)
An introduction to the application and theory of nonlinear optimization problems. The primary topics include: classical optimization based on the calculus, approximation techniques, separable programming, quadratic programming, gradient methods, and dynamic programming. *Prerequisite:* Math 452, 453.

MATH H481—HONORS SEMINAR IN MATHEMATICS—Credit to be arranged (3 and 0)
At the discretion of the instructor, attention will be focused upon mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis will be upon independent study and student use of previously acquired mathematical skills and his own ingenuity in the examination, presentation or preparation of mathematical papers. These papers may be expository or creative in content and may deal with applications of the mathematics under investigation. This honors course is open to students only by invitation for not more than three hours credit.

MATH H482—HONORS SEMINAR IN MATHEMATICS—Credit to be arranged. (3 and 0)
A continuation of Math H481.

MATH 613—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)

MATH 702—THEORY OF PROBABILITY—3 cr. (3 and 0)

MATH 703—STATISTICAL INFERENCE—3 cr. (3 and 0)

MATH 704—INTRODUCTION TO STOCHASTIC PROCESSES—3 cr. (3 and 0)

MATH 705—STATISTICAL THEORY AND METHODS II—3 cr. (3 and 0)

MATH 707—PARTIAL DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 708—TOPICS IN GEOMETRY—3 cr. (3 and 0)

MATH 709—STATISTICAL THEORY AND METHODS III—3 cr. (3 and 0)

MATH 711—LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 712—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)

MATH 713—MODERN ALGEBRA—3 cr. (3 and 0)

MATH 715—INTRODUCTION TO TOPOLOGY—3 cr. (3 and 0)

MATH 717—MATHEMATICS PROGRAMS—3 cr. (3 and 0)

MATH 725—INTERMEDIATE DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 729—NUMERICAL ANALYSIS I—3 cr. (3 and 0)

MATH 735—COMPLEX VARIABLES—3 cr. (3 and 0)

MATH 752—LINEAR PROGRAMMING—3 cr. (3 and 0)

MATH 753—ADVANCED CALCULUS I—3 cr. (3 and 0)

MATH 754—ADVANCED CALCULUS II—3 cr. (3 and 0)

MATH 757—APPLIED MATHEMATICS I—3 cr. (3 and 0)

MATH 758—APPLIED MATHEMATICS II—3 cr. (3 and 0)

MATH 763—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)

MATH 764—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)

MATH 801—GENERAL LINEAR HYPOTHESIS I—3 cr. (3 and 0)

MATH 802—GENERAL LINEAR HYPOTHESIS II—3 cr. (3 and 0)

MATH 803—STOCHASTIC PROCESSES I—3 cr. (3 and 0)

MATH 804—STOCHASTIC PROCESSES II—3 cr. (3 and 0)

MATH 805—ADVANCED METHODS IN PROBABILITY AND STATISTICS—3 cr. (3 and 0)

MATH 807—MATHEMATICAL STATISTICS I—3 cr. (3 and 0)

MATH 808—MATHEMATICAL STATISTICS II—3 cr. (3 and 0)

MATH 821—REAL ANALYSIS I—3 cr. (3 and 0)

MATH 822—REAL ANALYSIS II—3 cr. (3 and 0)

MATH 823—COMPLEX ANALYSIS I—3 cr. (3 and 0)

MATH 824—COMPLEX ANALYSIS II—3 cr. (3 and 0)

MATH 825—ORDINARY DIFFERENTIAL EQUATIONS I—3 cr. (3 and 0)

MATH 826—ORDINARY DIFFERENTIAL EQUATIONS II—3 cr. (3 and 0)

MATH 831—FOURIER SERIES—3 cr. (3 and 0)

MATH 833—OPERATIONAL MATHEMATICS—3 cr. (3 and 0)

MATH 835—COMPLEX VARIABLES—3 cr. (3 and 0)

MATH 837—CALCULUS OF VARIATIONS—3 cr. (3 and 0)

MATH 839—INTEGRAL EQUATIONS—3 cr. (3 and 0)

MATH 841—APPLIED MATHEMATICS I—3 cr. (3 and 0)

MATH 842—APPLIED MATHEMATICS II—3 cr. (3 and 0)

MATH 851—ABSTRACT ALGEBRA I—3 cr. (3 and 0)

MATH 852—ABSTRACT ALGEBRA II—3 cr. (3 and 0)

MATH 853—ADVANCED LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 854—THEORY OF GRAPHS I—3 cr. (3 and 0)

MATH 855—COMBINATORIAL ANALYSIS—3 cr. (3 and 0)

MATH 861—NUMERICAL ANALYSIS II—3 cr. (3 and 0)

MATH 863—CALCULUS OF FINITE DIFFERENCES—3 cr. (3 and 0)

MATH 871—GENERAL TOPOLOGY I—3 cr. (3 and 0)

MATH 872—GENERAL TOPOLOGY II—3 cr. (3 and 0)

MATH 873—ALGEBRAIC TOPOLOGY I—3 cr. (3 and 0)

MATH 874—ALGEBRAIC TOPOLOGY II—3 cr. (3 and 0)

MATH 875—CONVEXITY I—3 cr. (3 and 0)

MATH 876—CONVEXITY II—3 cr. (3 and 0)

MATH 881—HISTORY OF MATHEMATICS—3 cr. (3 and 0)

MATH 883—THEORY OF NUMBERS—3 cr. (3 and 0)

MATH 885—PROJECTIVE GEOMETRY—3 cr. (3 and 0)

MATH 891—RESEARCH—Credit to be arranged.

MATH 901—PROBABILITY THEORY I—3 cr. (3 and 0)

MATH 902—PROBABILITY THEORY II—3 cr. (3 and 0)

MATH 903—ADVANCED STOCHASTIC PROCESSES—3 cr. (3 and 0)

MATH 905—DECISION THEORY I—3 cr. (3 and 0)

MATH 906—DECISION THEORY II—3 cr. (3 and 0)

MATH 907—MULTIVARIATE ANALYSIS—3 cr. (3 and 0)

MATH 920—INTRODUCTION TO HARMONIC ANALYSIS—3 cr. (3 and 0)

MATH 921—ABSTRACT HARMONIC ANALYSIS I—3 cr. (3 and 0)

MATH 922—ABSTRACT HARMONIC ANALYSIS II—3 cr. (3 and 0)

MATH 923—INTRODUCTION TO THE THEORY OF DISTRIBUTION I—3 cr. (3 and 0)

MATH 924—INTRODUCTION TO THE THEORY OF DISTRIBUTION II—3 cr. (3 and 0)

MATH 925—TOPICS IN NON-LINEAR DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 927—FUNCTIONAL ANALYSIS I—3 cr. (3 and 0)

MATH 928—FUNCTIONAL ANALYSIS II—3 cr. (3 and 0)

MATH 929—FUNCTIONAL ANALYSIS III—3 cr. (3 and 0)

MATH 930—FUNCTIONAL ANALYSIS IV—3 cr. (3 and 0)

MATH 945—POTENTIAL THEORY I—3 cr. (3 and 0)

MATH 946—POTENTIAL THEORY II—3 cr. (3 and 0)

MATH 951—GROUP THEORY—3 cr. (3 and 0)

MATH 952—RING THEORY I—3 cr. (3 and 0)

MATH 953—RING THEORY II—3 cr. (3 and 0)

MATH 954—THEORY OF GRAPHICS II—3 cr. (3 and 0)

MATH 955—COMBINATORIAL ANALYSIS II—3 cr. (3 and 0)

MATH 956—FIELD THEORY—3 cr. (3 and 0)

MATH 957—SEMIGROUP THEORY I—3 cr. (3 and 0)

MATH 958—SEMIGROUP THEORY II—3 cr. (3 and 0)

MATH 980—SPECIAL TOPICS IN PROBABILITY—3 cr. (3 and 0)

MATH 981—SPECIAL TOPICS IN MATHEMATICAL STATISTICS—3 cr. (3 and 0)

MATH 982—SPECIAL TOPICS IN ANALYSIS—3 cr. (3 and 0)

MATH 983—SPECIAL TOPICS IN FUNCTIONAL ANALYSIS—3 cr. (3 and 0)

MATH 984—SPECIAL TOPICS IN APPLIED MATHEMATICS—3 cr. (3 and 0)

MATH 985—SPECIAL TOPICS IN ALGEBRA—3 cr. (3 and 0)

MATH 986—SPECIAL TOPICS IN CONVEXITY—3 cr. (3 and 0)

MATH 991—RESEARCH—credit variable.

MECHANICAL ENGINEERING

Professors: D. W. BRADBURY, J. L. EDWARDS, T. C. HARDIN, *Head;* E. HARRISON, A. D. LEWIS, S. M. WATSON, T. YANG

Associate Professors: A. C. ELROD, C. A. BRANDON, J. A. CHISMAN, E. F. COXE, W. G. HUDSON, D. W. LYONS, C. S. RUDISILL, I. S. TOLINS

Assistant Professor: J. K. JOHNSON, JR.

Instructor: J. R. FRAKER

ME 201—ENGINEERING DESIGN AND PRODUCTION—3 cr. (2 and 3)

An introduction to engineering design with emphasis on creativity, synthesis, participation in a realistic experience in design to satisfy human needs, experimentation and analysis commensurate with the student's background in mathematics and science. Problems are authentic. The building of a prototype, at least of critical parts, is the consummation of the design. Nontechnical aspects of engineering such as cost, market, contracts, and ethics are stressed. Engineering materials and methods of production are introduced to assist the student in making decisions concerning material selection and methods of production. *Corequisite:* EG 109, Phys 122, and Sophomore standing.

ME 299—DIGITAL COMPUTATION—1 cr. (0 and 3)

An introduction to digital computer programming for students majoring in mechanical engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in mechanical engineering. *Prerequisite:* Sophomore standing.

ME 304—HEAT TRANSFER I—3 cr. (3 and 0)

A comprehensive study of the principles of heat transmission with applications to engineering problems. Special emphasis is given to the following topics: heat conduction in the steady and unsteady states; dimensional analysis of convection; free and forced convection; the combined efforts of conduction, convection and radiation. *Prerequisite:* Junior standing, ME 311, or ChE 331, and Math 208.

ME 307—Mechanical Engineering Laboratory—1 cr. (0 and 2)
For those curriculums requiring one course in Mechanical Engineering Laboratory. The course is intended to illustrate mechanical engineering theory and to develop experimental technique. Experiments in the first and second laws of thermodynamics are covered. *Prerequisite:* ME 311.

ME 311—Engineering Thermodynamics I—3 cr. (3 and 0)
A study of thermodynamics as an engineering science. Topics stressed are the first and second laws of thermodynamics, properties of the pure substance, ideal gases, and gaseous mixtures. *Prerequisite:* Math 208, Phys 222, and Junior standing.

ME H311—Engineering Thermodynamics I—3 cr. (3 and 0)
Honors section of ME 311; admission by invitation.

ME 312—Engineering Thermodynamics II—3 cr. (3 and 0)
Chemical reactions and combustion, chemical equilibrium; analyses of processes and cycles; introduction to statistical thermodynamics, kinetic theory of gases, and irreversible thermodynamics. *Prerequisite:* ME 311.

ME 313—Instrumentation and Measurements—2 cr. (1 and 2)
Principles of measurements, accuracy of instruments, and data analysis. Modern instruments for measuring and recording static and dynamic pressures, temperatures, fluid flow, speed, power, and torque. *Prerequisite:* Enrollment in ME 311.

ME 314—Engineering Experimentation—2 cr. (1 and 2)
Theoretical, analytic and statistical aspects of basic engineering experimentation. Error analysis, dimensional analysis, experimental plans, and data analyses. *Prerequisite:* Math 313 and ME 313.

ME 316—Dynamic System Analysis—4 cr. (3 and 3)
Principles of dynamic system response with emphasis on the determination of mathematical models for mechanical, electrical, electomechanical, fluid and thermal systems. Differential equations are developed from a consideration of physical laws, system arrangement, and constraints. The Lagrangian state function and Lagrange's equation are introduced. Transient and steady-state analyses make use of Laplace transforms and frequence response techniques. Computers are used extensively. *Prerequisite:* Math 208, Phys 221, EM 202. *Corequisite:* EE 330, EE 331.

ME 321—Fluid Dynamics—3 cr. (3 and 0)
A continuation of EM 320. Topics include: concepts from thermodynamics; analogy between heat transfer and momentum transfer; reversible adiabatic flow with variable area; normal and oblique shocks and expansion fans; one dimensional flow in constant area ducts with friction and heat transfer; similarity laws in subsonic, transonic, and supersonic regions. *Prerequisite:* EM 320.

ME 401—Principles of Mechanical Engineering Design—3 cr. (3 and 0)
Stress, strain and strength considerations in engineering design. Theories of failure for yielding, brittle fracture and fatigue fracture are presented. Design considerations for impact, creep, elastic deflection, stress concentration, contact stresses and reliability are studied. Engineering problems are assigned to implement applications of principles of design. *Prerequisite:* EM 304, ME 316. *Corequisite:* CrE 310, Senior standing.

ME 402—MECHANICAL ENGINEERING ANALYSIS AND DESIGN—3 cr. (1 and 6)
The student is given the opportunity to apply creatively his general knowledge and his knowledge of engineering in the analysis and design of one or more engineering systems, machines, or devices. Problems may be selected from two sources: A meritorious problem of the student's own choice or a problem assigned by appropriate authority. *Corequisite:* ME 401, Senior standing.

ME 404—AUTOMATIC CONTROL—3 cr. (3 and 0)
Principles and techniques for the analysis and design of feedback control systems. State variable notation and modern control theory are introduced but emphasis is on the classical frequency domain and root locus techniques. Applications to electromechanical, hydraulic, and pneumatic systems. *Prerequisite:* ME 316, EE 332.

ME 406—PHYSICAL SYSTEMS ANALYSIS AND DESIGN—3 cr. (3 and 0)
A general approach to the analysis and synthesis of physical systems based on state variable representation, Lagrange's equations, matrix solution to state equations, and the calculus of variations. Computer solutions are obtained for application to mechanical, electrical, fluid, and thermal systems. *Prerequisite:* ME 316.

ME 408—INTRODUCTION TO COMPUTER-AIDED DESIGN—3 cr. (3 and 0)
Introduction to computer aided design, reliability, figures of merit, optimization techniques, search for extremes, and decision theory in design. Computer aided optimum design of engineering systems and the writing and use of problem-oriented languages will be emphasized. *Prerequisite:* Senior standing.

ME 411—GAS POWER—3 cr. (3 and 0)
A study of the effects of variation in specific heat, some fundamentals of compressible flow, the combustion process, and chemical dissociation. The theoretical and actual processes associated with the gas turbine, the thermal jet, the thermal rocket, and the spark ignition and compression ignition reciprocating engines are analyzed. *Prerequisite:* ME 312 and Senior Engineering.

ME 412—APPLIED THERMODYNAMICS—3 cr. (3 and 0)
Basic principles of first and second laws of thermodynamics applied to areas such as cryogenics, nonconventional energy conversion process, industrial process heat and electric power systems, etc. *Prerequisite:* ME 312.

ME 413—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
Experimental investigations in a wide variety of mechanical engineering areas, such as fluid dynamics, automatic control, heat and mass transfer, combustion, thermodynamics, and solid mechanics. *Prerequisite:* ME 313 and 314.

ME 414—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
Continuation of ME 413.

ME 415—UNDERGRADUATE RESEARCH—1 to 3 cr.
Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Consent of instructor.

ME H415—UNDERGRADUATE RESEARCH—1 to 3 cr.
Honors section of ME 415; admission by invitation.

ME 416—UNDERGRADUATE RESEARCH—1 to 3 cr.
Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Consent of instructor.

ME 422—Principles of Turbomachinery—3 cr. (3 and 0)
The guiding principles underlying all forms of turbomachinery. A unified treatment of turbomachinery to include pumps, fans, compressors and steam, gas and hydraulic turbines. Dimensional analysis as applied to turbomachinery, Euler's Equation, concepts of specific speed and thermodynamics of turbomachinery processes and allied topics are covered. *Prerequisite:* ME 312, EM 320, and Senior standing.

ME 424—Engineering Analysis—3 cr. (2 and 3)
A senior-level course requiring the student to utilize his knowledge of mathematics, fluid and solid mechanics, thermodynamics, heat transfer, and other background work in solving engineering problems. Both analog and digital computers are utilized as tools contributing to these solutions. *Prerequisite:* ME 299, ME 312, ME 304, EM 320.

ME 429—Air Conditioning—3 cr. (3 and 0)
A study of the principles of heating and air conditioning, including calculation of heat loss and heat gains for buildings, heating and cooling systems, psychrometric principles, air distribution, refrigeration and automatic control apparatus. *Prerequisite:* ME 304, 312, and Senior standing.

ME 430—Air Conditioning Design—1 cr. (0 and 3)
An application of the theory covered in ME 429 to the design of air-conditioning systems. *Prerequisite:* Enrollment in ME 429.

ME 441—Aeroelasticity—3 cr. (3 and 0)
Two and three dimensional theory of structural vibration and wing flutter. Lagrangian equations, energy methods, matrix methods and computer techniques for vibration analysis will be presented. Structural damping, aerodynamic forces, and flutter stability will be studied. Vertical bending, torsional vibration and flutter of fuselages, ailerons and stabilizers will be analyzed.

ME 480—Methods of Operations Research I—3 cr. (3 and 0)
Applications and elementary theory of selected topics from Operations Research. Topics included are linear algebra, linear programming, transportation and assignment problems, network analysis, and game theory. *Prerequisite:* ME 229 or equivalent.

ME 481—Methods of Operations Research II—3 cr. (3 and 0)
A continuation of ME 484. Topics included are nonlinear programming, dynamic programming, queuing theory, and markov processes. *Prerequisite:* Math 313 or equivalent.

ME 484—Engineering Economic Analysis—3 cr. (3 and 0)
Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness. *Prerequisite:* Senior standing in Engineering or consent of instructor.

ME 485—Industrial Application of Statistics—3 cr. (3 and 0)
Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability and analysis, and machine interference. *Prerequisite:* Math 313.

ME 486—Work Flow Systems and Control—3 cr. (3 and 0)
Fundamentals underlying the determination of production capacity requirements, economic lot sizes, and the regulating of flow and storage of materials to, within, and from the production system. Elements of forecasting, determination of materials requirements, scheduling, inventory control, etc. Consideration of data processing methods. *Prerequisite:* Math 313, consent of instructor.

ME 491—Selected Topics in Mechanical Engineering—3 cr. (3 and 0)
A comprehensive study of any topic in the field of Mechanical Engineering not covered in other courses.

ME 701—Principles of Mechanical Engineering Design—3 cr. (3 and 0)

ME 702—Mechanical Engineering Analysis and Design—3 cr. (1 and 6)

ME 704—Automatic Control—3 cr. (3 and 0)

ME 706—Physical Systems Analysis and Design—3 cr. (3 and 0)

ME 708—Computer-Aided Design—3 cr. (3 and 0)

ME 711—Gas Power—3 cr. (3 and 0)

ME 780—Methods of Operations Research I—3 cr. (3 and 0)

ME 781—Methods of Operations Research II—3 cr. (3 and 0)

ME 784—Engineering Economic Analysis—3 cr. (3 and 0)

ME 808—Fluid Mechanics—3 cr. (3 and 0)

ME 809—Aerodynamics—3 cr. (3 and 0)

ME 810—Advanced Thermodynamics—3 cr. (3 and 0)

ME 811—Gas Dynamics II—3 cr. (3 and 0)

ME 812—Boundary Layer Theory I—3 cr. (3 and 0)

ME 813—Gas Dynamics III—3 cr. (3 and 0)

ME 814—Hypersonics—3 cr. (3 and 0)

ME 815—Kinetics Theory of Gases—3 cr. (3 and 0)

ME 830—Heat Transfer II—3 cr. (3 and 0)

ME 831—Heat and Mass Transfer III—3 cr. (3 and 0)

ME 840—Kinematics II—3 cr. (3 and 0)

ME 842—Advanced Mechanical Engineering Design I—3 cr. (3 and 0)

ME 843—Advanced Mechanical Engineering Design II—3 cr. (3 and 0)

ME 844—Dynamics of Elastic Mechanical Systems—3 cr. (3 and 0)

ME 860—Dynamic Programming—3 cr. (3 and 0)

ME 861—Nonlinear Programming—3 cr. (3 and 0)

ME 862—Analytical Methods of Systems Analysis—3 cr. (3 and 0)

ME 863—Advanced Physical Systems I—3 cr. (3 and 0)

ME 864—Advanced Physical Systems II—3 cr. (3 and 0)

ME 865—Modern Control Theory—3 cr. (3 and 0)

ME 866—Nonlinear Automatic Controls—3 cr. (3 and 0)

ME 867—Control System Components—3 cr. (3 and 0)

ME 868—Control of Aerospace Systems—3 cr. (3 and 0)

ME 870—Biosystems Analysis—3 cr. (3 and 0)

ME 880—Advanced Methods of Operations Research I—3 cr. (3 and 0)

ME 881—Advanced Methods of Operations Research II—3 cr. (3 and 0)

ME 882—Reliability Engineering—3 cr. (3 and 0)

ME 883—Operations System Simulation I—3 cr. (3 and 0)

ME 884—Operations System Simulation II—3 cr. (3 and 0)

ME 886—Operations Research in Production Control—3 cr. (3 and 0)

ME 891—Research—Credit to be arranged.

ME 893—Selected Topics in Mechanical Engineering—1-6 cr. (1-6 and 0)

ME 912—Boundary Layer Theory II—3 cr. (3 and 0)

ME 914—Magnetohydrodynamics—3 cr. (3 and 0)

ME 915—Energy Conversion—3 cr. (3 and 0)

ME 930—Conduction Heat Transfer—3 cr. (3 and 0)

ME 931—Convection Heat Transfer—3 cr. (3 and 0)

ME 932—Radiation Heat Transfer—3 cr. (3 and 0)

ME 940—Applied Plasticity—3 cr. (3 and 0)

ME 941—Theory of Lubrication and Wear—3 cr. (3 and 0)

ME 991—Doctoral Research—Credit to be arranged.

MEDICAL TECHNOLOGY

Anderson—*Lecturers:* J. W. Black, R. E. Jones. Jr., N. L. Long
Teaching Supervisor: Kay Little

Greenville—*Lecturers:* E. C. Cox, E. A. Dreskin, D. G. Kilgore, Jr.,
J. H. McCarter, W. M. Waters
Teaching Supervisor: Patricia Thompson

Med Tech 401—Serology and Immunology—4 cr. (21,10,49)*
Presents the basic principles of serology and immunology and the tests utilizing these principles to detect abnormalities helpful in the diagnosis of disease.

Med Tech 402—Microbiology—7 cr. (59,6,470)
The principles of microbiology-bacteriology, mycology, and parasitology. Emphasis is placed on human pathogenic organisms, using both fresh and prepared organisms.

Med Tech 403—Hematology—5 cr. (12,32,276)
Information on blood as a tissue, the theory of hematological tests, factors that affect test reliability. Knowledge of test results and knowledge of blood dycrasias. Skill in the performance of hematological tests is emphasized and the use of automation techniques is covered.

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* First figure represents lecture hours, second figure represents seminar hours, and the third figure represents clinical practice hours.

Med Tech 404—Blood Bank—3 cr. (8,20,132)
History and principles of blood group systems and methods of cross matching. Test for, and quantitative determination of, Rh antibodies with all available techniques. Selection, pre-testing and bleeding of donors and processing of blood for transfusions.

Med Tech 405—Cytology—1 cr. (2,12,26)
An introduction to cytology and cytologic techniques in the diagnosis of cancer. Definition and brief history, sources of material, collection and preservation of specimens, together with practice in interpretation.

Med Tech 406—Histology—3 cr. (20,30,190)
Histologic preparation, including actual preparation of tissue specimens derived from surgical procedures and autopsies. Routine and special staining, together with experience using the Cryostat.

Med Tech 407—Urinalysis—2 cr. (10,8,102)
The study of renal function together with principles of urine analysis, pregnancy tests and anatomy of the urinary system. Emphasis is placed on laboratory procedures and their utilization to detect abnormalities helpful in the diagnosis of disease.

Med Tech 408—Chemistry—10 cr. (40,50,470)
Introduction to the chemistry of carbohydrates, nitrogen, calcium, and phosphorus compounds, acid-base balance, etc., with emphasis on the chemistry of blood and urine using both qualitative and quantitative procedures in the laboratory.

Med Tech 409—Radioisotopes—1 cr. (2,0,7)
Introduction to principles of diagnostic radioisotope procedures and the use of the scintillation detector, the well counter, and the scaler.

METALLURGICAL ENGINEERING

Associate Professor: S. F. Hulbert, *Program Coordinator*

MetE 301—Physical Metallurgy—3 cr. (2 and 3)
The first of two sequential courses to acquaint the student with the nature and properties of metals. The properties of metals are defined and studied in terms of solid state physics which explains how and why metals have the useful properties that they do possess. Basic metal forming processes involving these principles are studied. *Prerequisite:* MetE 202 or 302.

MetE 302—General Metallurgy—3 cr. (2 and 3)
Basic general metallurgy for students in Engineering and related curriculums. This course is designed to acquaint students with the properties of metals so that they may select intelligently for engineering applications. The nature of metals and of metal working processes are considered. *Prerequisite:* Junior standing in Engineering.

MetE 304—Physical Metallurgy—3 cr. (2 and 3)
A continuation of MetE 301. In this portion of the course alloys are considered particularly. The use of an equilibrium diagram to represent properties and phases is studied. The student learns to interpret and construct these diagrams. Solid state phase changes are studied, such as occur in the heat treating of steel and the age hardening of aluminum alloys. *Prerequisite:* MetE 301.

MetE 320—Mechanical Metallurgy—2 cr. (2 and 0)
The processes whereby useful shapes are formed in metal, and the response of the metal to the deformative forces. Rolling, forging, extrusion, drawing and "high energy" deformations are studied. The effects of these forces on the character and properties of the metal are evaluated. *Prerequisite:* MetE 304 or consent of instructor.

MetE 323—Metallography—2 cr. (1 and 3)
The development of techniques necessary for metallographic investigations. The selection, cutting, mounting and polishing of specimens; the use of the microscope; the techniques of etching, and of photography. Training in the use of laboratory equipment in evaluating metallic material. *Prerequisite:* MetE 304, or MetE 302 and consent of instructor.

MetE 350—Metallurgy of Cast Metals—3 cr. (2 and 3)
The fundamentals of melting, fluxing, pouring, and the control of the solidification of metals in molds. The metallurgical aspects of the production of all kinds of castings—sand mold, permanent mold, shell mold, die casting, and centrifugal casting. Studies are made of the physical properties of castings. *Prerequisite:* MetE 302 or MetE 304.

MetE 402—Metallurgical Literature—1 cr. (0 and 3)
To acquaint students with sources of information on metallurgy and to develop a background for the senior thesis. *Prerequisite:* Senior standing in Metallurgical Engineering.

MetE 408—Heat Treating—3 cr. (2 and 3)
The phase changes in both ferrous and non-ferrous metals caused by changes in environment at significant times in the processing. Studies relating the time-temperature changes in metals with their physical properties. *Prerequisite:* MetE 302 or MetE 304.

MetE 425—Senior Thesis—2 cr. (0 and 6)
The independent investigation of a project in Metallurgical Engineering. A competent bachelor thesis is required. *Prerequisite:* Senior standing in Metallurgical Engineering.

MetE 430—Powder Metallurgy—3 cr. (2 and 3)
The production of metal powders and of articles from these powders. By powder metal techniques it is possible to produce controlled porosity, unconventional alloys and to produce complex parts of limited size rapidly, accurately, and economically. Combinations of metals and non-metals may be produced. *Prerequisite:* MetE 302 or MetE 304.

MetE 440—Metallurgy of Reactor Materials—3 cr. (2 and 3)
The metallurgy of materials used in reactor construction. The physical metallurgy of metallic fuels, controls, reflectors, and shielding. The effects of radiation on structural metals will be considered. *Prerequisite:* Senior standing and the consent of the instructor.

MetE 450—Metallic Corrosion—3 cr. (2 and 3)
The corrosion of metallic materials and means of preventing such corrosion. Environmental factors in corrosion are considered. *Prerequisite:* MetE 302 or MetE 304.

MetE 455—Electrometallurgy—3 cr. (2 and 3)
The electrowinning and electrorefining of metals. Electrothermic cells will be studied. The principles and operation of electric furnaces will be considered. Electroplating, electroetching and electromachining will be studied. *Prerequisite:* MetE 302 or MetE 304 and EE 308.

MICROBIOLOGY

(See also Biology)

Professor: R. K. Guthrie

Associate Professor: J. H. Bond

Assistant Professors: Ann W. Baxter, M. J. B. Paynter, *Chairman*

Micro 301—General Microbiology—4 cr. (3 and 3) F, S, SS
Morphology, physiology, classification, distribution, and cultivation of microorganisms and health. *Prerequisite:* Bot 101 or Zool 101 and 103; Ch 101; Ch 102.

Micro 401—Advanced Bacteriology—4 cr. (2 and 6) F
Metabolism, nutrition, growth, and death of bacteria; microbiological assays and industrial fermentation; emphasis on laboratory procedures for the identification of the more common taxonomic groups. *Prerequisite:* Micro 301; Ch 220 or 223 and 227.

Micro H401—Advanced Bacteriology—4 cr. (2 and 6) F
Honors option for Micro 401, admission by special arrangement.

Micro 402—Dairy Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
Morphology, physiology, and culturing of microorganisms of importance in dairy products; standard methods for the determination of numbers of bacteria, yeasts, and molds in various dairy products. *Prerequisite:* Micro 301.

Micro H402—Dairy Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
Honors option for Micro 402, admission by special arrangement.

Micro 404—Food Microbiology—3 cr. (2 and 3)
S, '71 and alternate years.
The microbiology of natural and processed foods. The nature of microorganisms involved in food processing, food spoilage, and food poisoning. Methods of isolating, enumerating and identifying these organisms are conducted in the laboratory. *Prerequisite:* Micro 301.

Micro H404—Food Microbiology—3 cr. (2 and 3)
S, '71 and alternate years.
Honors option for Micro 404, admission by special arrangement.

Micro 410—Soil Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
The role of microorganisms in the decomposition of organic substances; transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. *Prerequisite:* Micro 301.

Micro H410—Soil Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
Honors option for Micro 410, admission by special arrangement.

Micro 411—Pathogenic Bacteriology—3 cr. (2 and 3) S
A study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the diseases caused. *Prerequisite:* Micro 301.

Micro H411—Pathogenic Bacteriology—3 cr. (2 and 3) S
Honors option for Micro 411, admission by special arrangement.

Micro 412—Bacterial Physiology—4 cr. (3 and 3) S
A consideration of the cytology, physiology, metabolism, and genetics of bacteria. Included will be studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. *Prerequisite:* Micro 301, Organic Chemistry.

Micro H412—Bacterial Physiology—4 cr. (3 and 3) S
Honors option for Micro 412, admission by special arrangement.

Micro 413—Industrial Microbiology—3 cr. (2 and 3)
Microbial aspects of large scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. *Prerequisite:* Micro 301.

Micro H413—Industrial Microbiology—3 cr. (2 and 3)
Honors option for Micro 413, admission by special arrangement.

Micro 414—Basic Immunology—3 cr. (2 and 3)
A consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigenantibody and other immune reactions. *Prerequisite:* Micro 301, Organic Chemistry.

Micro H414—Basic Immunology—3 cr. (2 and 3)
Honors option of Micro 414, admission by special arrangement.

Micro 415—Microbial Genetics—4 cr. (3 and 3)
The cytological basis of bacterial genetics; some molecular aspects; mutation and mutagenic agents; population changes; mechanisms of genetic transfers; bacterial viruses as genetic systems; episomes and plasmids. The genetics of certain fungi and of animal and plant viruses will also be considered. *Prerequisite:* Micro 301, Gen 302, Ch 224.

Micro H415—Microbial Genetics—4 cr. (3 and 3)
Honors option for Micro 415, admission by special arrangement.

Micro 416—Introductory Virology—3 cr. (3 and 0)
A general introduction to the field of virology, including animal, bacterial, and plant viruses. Topics will include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay and purification. *Prerequisite:* Micro 301.

Micro H416—Introductory Virology—3 cr. (3 and 0)

Honors option for Micro 416, admission by special arrangement.

MICRO 601—GENERAL MICROBIOLOGY—4 cr. (3 and 3)

MICRO 701—ADVANCED BACTERIOLOGY—4 cr. (2 and 6)

MICRO 702—DAIRY MICROBIOLOGY—3 cr. (2 and 3)

MICRO 704—FOOD MICROBIOLOGY—3 cr. (2 and 3)

MICRO 710—SOIL MICROBIOLOGY—3 cr. (2 and 3)

MICRO 711—PATHOGENIC BACTERIOLOGY—3 cr. (2 and 3)

MICRO 712—BACTERIAL PHYSIOLOGY—4 cr. (3 and 3)

MICRO 713—INDUSTRIAL MICROBIOLOGY—3 cr. (2 and 3)

MICRO 714—BASIC IMMUNOLOGY—3 cr. (2 and 3)

MICRO 715—MICROBIAL GENETICS—4 cr. (3 and 3)

MICRO 716—INTRODUCTORY VIROLOGY—3 cr. (3 and 0)

MICRO 801—BACTERIAL TAXONOMY—3 cr. (2 and 3)

MICRO 802—BACTERIOLOGICAL TECHNIC—4 cr. (2 and 6)

MICRO 803—SPECIAL PROBLEMS IN MICROBIOLOGY—Credit to be arranged.

MICRO 807—SEMINAR—1 cr. (1 and 0)

MICRO 810—SOIL MICROBIOLOGY—3 cr. (2 and 3)

MICRO 811—BACTERIAL CYTOLOGY AND PHYSIOLOGY—4 cr. (4 and 0)

MICRO 812—BACTERIAL METABOLISM—3 cr. (3 and 0)

MICRO 813—BACTERIAL CYTOLOGY AND PHYSIOLOGY LABORATORY—2 cr. (0 and 6)

MICRO 814—BACTERIAL METABOLISM LABORATORY—2 cr. (0 and 6)

MICRO 815—ADVANCED MICROBIAL GENETICS—3 cr. (3 and 0)

MICRO 891—RESEARCH—Credit to be arranged.

MILITARY SCIENCE

Professor: COLONEL GEORGE K. MAERTENS

Assistant Professors: LT. COL. V. D. R. GUIDE, LT. COL. J. F. HARE, LT. COL. J. H. MOZELEY III, LT. COL. C. F. TISDALE, MAJ. A. R. ERICKSEN, MAJ. E. L. FAIRBROTHER, MAJ. J. B. HORTON, MAJ. T. R. KING, MAJ. J. D. RABON, MAJ. W. M. SHEPHERD, MAJ. C. D. THRASHER, CAPT. N. K. HOOK, JR., CAPT. R. R. IRVING, JR., CAPT. J. P. JACKSON, CAPT. P. H. KEATING, CAPT. J. A. MCCORMACK, CAPT. S. P. MEYER, CAPT. C. W. RUPLE, CAPT. R. J. STOEWE

MS 101—FUNDAMENTALS (BASIC)—1 cr. (2 and 1)

A study of the evolution, organization, and mission of the Reserve Officers' Training Corps, individual weapons and marksmanship and the evolution of weapons and warfare. An introduction to First Aid, mass casualty treatment and Chemical Biological and Radiological Warfare and discussion seminar on current events. Laboratory periods provide training in basic drill, discipline, and leadership.

MS 102—The National Defense (Basic)—1 cr. (2 and 1)

A study of the organization of the Department of Defense and its role in national security. An introduction to the history, organization, equipment and mission of the United States Army, with detailed study of small units. A look at the principles and types of war and leadership traits. Current events seminar. Drill.

MS 201—American Military History (Basic)—1 cr. (2 and 1)

A survey of American military history from the origins of the American Army to the present, with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social and similar patterns found in our present-day Army.

MS 202—Introduction to Operations and Basic Tactics and Map and Aerial Photograph Reading (Basic)—1 cr. (2 and 1)

An introduction to the organization, composition, and mission of infantry rifle squad and small infantry-tank teams. Interpretation and use of maps and aerial photographs in study and evaluation of terrain.

MS 300—Military Science (Advanced)—6 cr. (ROTC 3, Elective 3)

Study and practical application of Leadership; Military Teaching Principles; Branches of the Army; Small Unit Tactics and Communications. Further training for duty as officers by application of principles of leadership in actual command during drills, parades, reviews, inspections and ceremonies. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective course or Advanced ROTC during either semester but must participate in Leadership Laboratory Training throughout the school year.

Three class hours and one laboratory hour (presented by Military Science Department) each week in one semester and three class hours (elective presented by appropriate department) and one laboratory hour (presented by Military Science Department) each week in the other semester.

MS 400—Military Science (Advanced)—6 cr. (ROTC 3, Elective 3)

A study of Military Operations; Logistics; Administrative Management; Military Law; Service Orientation; World Change and Military Implications; Internal Defense/Development; and Leadership Laboratory. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective or Advanced ROTC during either semester but must participate in Leadership Laboratory Training throughout the school year.

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

MUSIC

Associate Professor: J. H. Butler, *Head*

Assistant Professors: B. F. Cook, E. A. Freeman

Instructors: G. A. Benson, Edith B. Card, J. E. Jackson [*]

Mus 151—Applied Music—1 cr. (1 and 0)

Individual study in performance medium (voice, piano, flute, oboe, clarinet, saxophone, bassoon, cornet, trumpet, French Horn, trombone, baritone, tuba, percussion). One hour-long private lesson each week, for which a minimum of four hours' practice is required. The student is guided in a continuing advance of his technical and artistic proficiency, and is required to perform an appropriate solo in a student recital each semester. May be repeated for credit with departmental approval to allow for the study of differing performance media. *Prerequisite:* Consent of instructor, based on a qualifying audition.

Mus 152—Applied Music—1 cr. (1 and 0)

A continuation of Mus 151. *Prerequisite:* Mus 151.

Mus 310—Music Appreciation: Music in the Western World—3 cr. (3 and 0)

Designed to widen and deepen the student's appreciation of his musical heritage through a study of the development of music in Western culture from the time of the early Christians to the present.

Mus 315—Music History—3 cr. (3 and 0)

The development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods.

Mus 316—Music History—3 cr. (3 and 0)

Continuation of Mus 315. Music from 1750 to present. *Prerequisite:* Mus 315.

Mus 361—Marching Band—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Fall semester only. *Prerequisite:* Consent of director.

Mus 362—Concert Band—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Spring semester only. *Prerequisite:* Consent of director.

Mus 363—Men's Glee Club—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Prerequisite:* Consent of director.

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[*] On leave.

Mus 364—Women's Glee Club—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Prerequisite:* Consent of director.

Mus 365—University Chorus—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Prerequisite:* Consent of instructor.

Mus 400—Music in the Elementary School Classrooms—3 cr. (3 and 0)

Designed to give the teacher in the elementary school a familiarity with music suitable for use with children at the elementary level. Recordings of appropriate music, pre-band instruments, unison and part singing will be included. No previous training in music is required.

Mus 401—Methods and Materials in Elementary School Music—3 cr. (3 and 0)

Materials, methods, and techniques in elementary school. *Prerequisite:* Mus 400.

Mus 405—Music Theory—3 cr. (3 and 0)

The principles of notation, its symbols and abbreviations, major and minor scales, intervals and chords, measure, rhythm and tempo, and the terminology of music are the principal topics covered in this course.

Mus 406—Music Theory 3 cr. (3 and 0)

Continuation of Mus 405 with emphasis on sight singing, melodic dictation, and secondary chord structure. *Prerequisite:* Mus 405.

Mus 411—American Music: Music Appreciation—3 cr. (3 and 0)

Music in America from 1620 to the present. Indigenous and borrowed influences will be examined.

NURSING

(Associate Degree Program)

Assistant Professors: Dorothy C. Davenport, Aileen S. Prevost

Instructors: Edith G. Gunter, Esther B. Privette, Harriett E. Whitley

Nurs 101—Introduction to Nursing—6 cr. (3 and 9)

An introduction to nursing through historical concepts, interpersonal relations, health, hygiene, hospital community, basic nursing skills, asepsis, medications, assisting with diagnostic and therapeutic measures. Concurrent laboratory experiences are carefully selected.

Nurs 102—Acute Illness—Adult—6 cr. (2 and 12)

Built on the concepts of Nurs 101 with increasing depth to include—beginning understandings of body responses to illness. Carefully selected clinical experiences continue. *Prerequisite:* First semester courses in Nursing with C standing.

Nurs 104—Medical-Surgical Nursing I—5 cr. (3 and 6)
A continuation of Nurs 102. It is concerned with nursing care of adult patients with long term illnesses and focuses on disruption of family living. *Prerequisite:* Second semester courses in Nursing with C standing.

Nurs 105—Integrated Science I—4 cr. (3 and 3)
A general course surveying chemistry, human anatomy, physiology, and microbiology, and emphasizing the physical and chemical bases for physiology.

Nurs 106—Integrated Science II—4 cr. (3 and 3)
Continuation of Nurs 105.

Nurs 201—Psychodynamic Nursing—5 cr. (3 and 6)
Designed to develop basic understandings and skills in the nursing care of patients with behavioral and anxiety problems. Lectures, discussions, field trips and clinical experiences are used concurrently. *Prerequisite:* Nurs 202 and Nurs 206 with C standing.

Nurs 202—Pediatrics—5 cr. (3 and 6)
This course presents the nursing care of children from infancy to adolescence. It considers disease processes that cause deviations from normal through all stages of growth and development. *Prerequisite:* Nurs 104 with C standing.

Nurs 204—Maternal and Newborn Care—5 cr. (3 and 6)
This course deals with prenatal, labor, delivery, postpartum care of the mother, and needs of the newborn infant. *Prerequisite:* Nurs 202 and Nurs 206 with C standing.

Nurs 206—Medical-Surgical Nursing II—6 cr. (3 and 9)
This is a continuation of Nurs 104. Emphasis is placed on the planning and executing care plans for groups of patients in conjunction with various co-workers present in hospital settings today. The student is introduced to her responsibilities as a graduate nurse. *Prerequisite:* Nurs 104 with C standing.

NURSING

(Baccalaureate Degree Program)

Professor: Geraldine Labecki, *Director*

Associate Professors: Elizabeth J. Hall, Rose A. Godbout

Assistant Professor: Regina Thompson

Instructor: Opal S. Hipps

Lecturers: Marilyn B. Chassie, Juanita F. Woods

Nurs 207—Dynamics of Human Relations—3 cr. (2 and 3) S
The purpose of this course is to further the student's knowledge of behavioral influences and serves to introduce the student to the nurse's role in interpersonal relationships; emphasis is placed on her role in the motivation of individuals toward health. Laboratory practice with adults in clinic settings, and with children attending pre-school agencies.

Nurs 208—Problem Solving in Nursing—3 cr. (2 and 3)
Introduction to the concept of problem solving in nursing. Selected models are presented and analyzed. Relevant technical skills identified in the analysis are learned. Emphasis is on the creative approach to solving nursing problems and the utility of the technic to the solution. Laboratory experiences are with

patients in the Greenville Hospital System and in the classroom. *Prerequisite:* Successful completion of this course for all upper division courses in Nursing.

NURS 309—HUMAN VALUES IN NURSING—3 cr. (3 and 0)
The values guiding nursing theory and practice, including common human needs; the nature of man and his community.

NURS 310—PERSPECTIVES IN NURSING INTERVENTION—3 cr. (3 and 0)
Analysis of the decision making process used in making independent nursing judgments. Include planning, implementing and evaluation of nursing care.

NURS 311—NURSING DURING ALTERATIONS IN LIFE PATTERNS—4 cr. (1 and 9)
Guided experience and study in the ways people perceive and cope with change in life's patterns; emphasis on the synthesis of knowledge from the arts and sciences as basis for deliberative nursing action. Includes hospital laboratory experience in care of mothers, children and adults.

NURS 312—NURSING OF THE ACUTE AND CHRONICALLY DISTRESSED—4 cr. (1 and 9)
Nursing concepts based on a broad patho-psycho-physiologic approach in understanding of changes in functions as a result of stress and disease. The study of nursing in agencies caring for the physically and mentally ill person.

NURS 313—THE PROMOTION OF HEALTH—3 cr. (2 and 3)
Teaching of health in the home and in agencies concerned with the prevention of illness and the improvement of health with nutrition as a positive factor.

NURS 314—NURSING IN THE HOME—3 cr. (2 and 3)
The dimensions of caring for the ill in the home; includes early detection, treatment, and the use of resources with emphasis on continuity of care.

NURS 415—NURSING AS A SOCIAL FORCE—3 cr. (3 and 0)
The role of professional nursing in the light of changes in the health systems. Individual and collective definitions of health. Comprehensive planning and community health.

NURS 417—INTENSIVE NURSING—4 cr. (1 and 9)
Nursing care in highly stressful situations. The dimensions of assisting individuals and families in coping with life-threatening erperiences. Laboratory experiences such as the care of premature infants, patients with cardiac problems, and patients with marked regression.

NURS 419—THE MULTIPROBLEM FAMILY—3 cr. (2 and 3)
Focus is on the family as a unit of care. Use of the epidemiologic approach as a tool in the understanding of conditions influencing the family, such as social deprivation and malnutrition.

NURS 421—HISTORY AND PHILOSOPHY OF NURSING—3 cr. (3 and 0)
Analysis of the development of modern nursing. Emphasis will be placed on how the nursing profession articulates with society and the role of nurses as change agents. Consideration will be given to the legal and ethical implications in nursing practice.

NURS 422—CURRENT RESEARCH IN NURSING—3 cr. (3 and 0)
A study of approaches to problematic situations in nursing, with emphasis on interpretation of findings.

NURS 425—INDEPENDENT STUDY IN NURSING—7 cr. (3 and 12)
Provides opportunity for students to focus on an in-depth study in an area of special concern in clinical nursing.

NUTRITION

Professors: B. D. BARNETT, W. A. KING, R. F. WHEELER, W. P. WILLIAMS, JR.

Associate Professors: R. F. BORGMAN, W. V. CHALUPA, R. L. EDWARDS, D. E. TURK

Assistant Professors: L. CROOK, D. M. HENRICKS, J. J. JEN

(See courses listed under Animal Science, Biochemistry, Dairy Science, Food Science, and Poultry Science)

NUTR 103—PRINCIPLES OF NUTRITION—4 cr. (3 and 3)
Nutrition is discussed in relation to the requirement and role of nutrients in mammalian metabolism—nutrition and disease are emphasized. Laboratory exercises demonstrate nutrient assay methods and the importance of selected nutrients in mammalian diets.

NUTR 401—FUNDAMENTALS OF NUTRITION—3 cr. (3 and 0) F
Biochemical and physiological fundamentals of nutrition applicable to domestic animals and man. Considered are digestive processes, and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals and vitamins. Energy metabolism and comparative anatomy and physiology of digestive systems are discussed.

NUTR 701—FUNDAMENTALS OF NUTRITION—3 cr. (3 and 0)

NUTR 851—NUTRITION SEMINAR I—1 cr. (1 and 0)

NUTR 852—NUTRITION SEMINAR II—1 cr. (1 and 0)

NUTR 891—RESEARCH—Credit to be arranged.

NUTR 991—DOCTORAL RESEARCH—Credit to be arranged.

PHILOSOPHY

Assistant Professors: R. B. HARRIS, J. L. MCCOLLOUGH, D. F. WHITE, JR.

PHIL 201—INTRODUCTION TO PHILOSOPHY—3 cr. (3 and 0)
An introduction to the basic issues involved in philosophical thinking, with special emphasis upon these issues as they occur in Greek philosophy. The systems of Plato and Aristotle will be considered in some detail.

PHIL 202—LOGIC—3 cr. (3 and 0)
An introduction to the methods and techniques of logic and continuing to elementary symbolic logic.

PHIL 303—PHILOSOPHY OF RELIGION—3 cr. (3 and 0)
An analytical and critical consideration of the philosophical foundations of religion. Such topics as the existence of God, the problem of evil, theism and atheism, prayer, and immortality will be considered.

PHIL 304—INTRODUCTION TO ETHICAL THEORY—3 cr. (3 and 0)
An examination of moral judgment; its concepts, criteria and relations to factual judgment. Classical theories and current issues are searched for an

ideal of the good man and the life we prize. Construction of a model theory of obligation, value, justice, and punishment is attempted.

PHIL 305—AESTHETICS—3 cr. (3 and 0)

A study of the function of art in human life along with a consideration of the various philosophical elements involved in art and art criticism. Various historical types of aesthetic theory will be considered. *Prerequisite:* Junior standing or permission of the instructor.

PHIL 309—RELIGION OF THE FAR EAST—3 cr. (3 and 0)

A study of the origin, evolution, and contemporary status of Hinduism, Buddhism, Confucianism, and Taoism. *Prerequisite:* Junior standing.

PHIL 312—MODERN PHILOSOPHY—3 cr. (3 and 0)

The development of the modern mind as seen in the Renaissance and Eighteenth Century philosophers. The writings of Hobbes, Locke, Spinoza, Leibniz, Hume, and Kant will be considered along with the development of Rationalism and Empiricism.

PHIL 318—CONTEMPORARY PHILOSOPHY—3 cr. (3 and 0)

A study of some of the recent schools and movements in philosophy. Pragmatism, Existentialism, Vitalism, Recent Realism, and some of the linguistic schools will be considered.

PHIL 322—SYMBOLIC LOGIC—3 cr. (3 and 0)

A consideration of the necessary logical structure of a very exact language in terms of modern relational logic. Quantification, Truth Functions, Propositional Functions, Properties of Relations, Arguments Involving Relations, and some non-formal logical systems will be considered. *Prerequisite:* Phil 302 or Math 205 or a computer programming course.

PHIL 344—CURRENT ETHICAL THEORY—3 cr. (3 and 0)

An examination of present trends in ethical and meta-ethical theory for their bearing upon the criteria of our judgments of human conduct and character and upon current moral issues. Selected topics from the logic, epistemology, and psychology of ethical judgment will be considered, with review of relevant journal literature. *Prerequisite:* Phil 304 or permission of the instructor.

PHIL 422—MATHEMATICAL LOGIC—3 cr. (3 and 0)

A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Phil 322 or sufficient mathematical background.

PHIL 425—PHILOSOPHY OF SCIENCE—3 cr. (3 and 0)

A study of the presuppositions, categories, and implications of the physical and social sciences with special reference to the concepts of Space and Time, Matter, Causation, and Relativity. The logic of "scientific method" and the unity of the sciences are considered. *Prerequisite:* Junior standing and permission of the instructor.

PHIL 825—SEMINAR IN PHILOSOPHY OF SCIENCE—3 cr. (3 and 0)

PHYSICAL SCIENCE

(Jointly administered by the Chemistry and Physics Departments)

Phy Sc 101—Physical Science I—4 cr. (3 and 2)

An introduction to the physical sciences. Selected topics will be discussed to illustrate the structure and meaning of the physical sciences. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

Phy Sc 102—Physical Science II—4 cr. (3 and 2)

A continuation of Phy Sc 101. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

PHYSICS

Professors: L. D. Huff, M. J. Skove, E. P. Stillwell, H. E. Vogel, *Head*

Associate Professors: P. B. Burt, R. L. Chaplin, Jr., W. E. Gettys, J. L. Ging, H. W. Graben, A. L. Laskar, D. P. Miller, M. G. Miller, M. D. Sherrill, K. L. Wood

Assistant Professors: T. F. Collins,* J. A. Gilreath, F. J. Keller, J. R. Manson, J. R. Ray, P. A. Steiner, R. C. Turner, C. W. Ulbrich

Phys 101—Current Topics in Modern Physics—1 cr. (0 and 2)

Demonstrations and lectures supplemented by slides and motion pictures on current topics in physics, such as superfluids, lasers, superconductors, elementary particles, etc., chosen from the fields of atomic, nuclear, solid state physics, and astrophysics. Several members of the staff will participate.

Phys 122—Mechanics and Wave Phenomena—3 cr. (3 and 0)

Vectors; laws of motion; rotation; vibratory and wave motion; mechanical properties of materials. *Prerequisite:* Registration in Math 205.

Phys H122—Mechanics and Wave Phenomena—3 cr. (3 and 0)

Honors section of Phys 122. Open by invitation only.

Phys 132—General Physics for Physics Majors—3 cr. (3 and 0)

Introduction to physical quantities, linear and rotational motion, conservation laws, gravitational and electric fields, and kinetic theory. *Prerequisite:* Registration in Math 205.

Phys 201—General Physics—3 cr. (3 and 0)

Motion; equilibrium; the conservation of momentum, mass and energy; vibrations; waves; temperature and heat. *Prerequisite:* Registration in Phys 203.

Phys 202—General Physics—3 cr. (3 and 0)

A continuation of Phys 201: Optics of lenses and mirrors; light waves; electric charges and currents, magnetism, electric and magnetic fields; properties of atomic particles; structure of atoms. *Prerequisite:* Phys 201 and registration in Phys 204.

Phys 203—General Physics Laboratory—1 cr. (0 and 3)

Experiments designed to test or exemplify the laws studied in Phys 201 and to introduce precision measuring instruments. *Prerequisite:* Registration in Phys 201.

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* On leave.

Phys 204—General Physics Laboratory—1 cr. (0 and 3)
A continuation of Phys 203 using optical and electrical instruments. *Prerequisite:* Registration in Phys 202.

Phys H221—Thermal and Electrical Phenomena—3 cr. (3 and 0)
Thermal properties of matter; electric and magnetic fields; electric currents and circuits; motions of charged particles in fields. *Prerequisite:* Phys 122.

Phys 221—Thermal and Electrical Phenomena—3 cr. (3 and 0)
Honors section in Phys 221. Open by invitation only.

Phys 222—Optics and Modern Physics—3 cr. (3 and 0)
Theory of light waves and photons; optical instruments; relativity; atomic particles; nuclear physics. *Prerequisite:* Phys 221.

Phys H222—Optics and Modern Physics—3 cr. (3 and 0)
Honors section in Phys 222. Open by invitation only.

Phys 223—Electron Physics Laboratory—1 cr. (0 and 3)
An introduction to physical experimentation employing the Berkeley A laboratory course. Experiments are performed in acceleration and deflection of electrons, measurement of electron charge to mass ratio by helical motion and time of flight, oscillating systems involving capacitance, resistance and inductance, resonance, modulation, negative resistance and relaxation oscillations. *Prerequisite:* Registration in Phys 221 or 231.

Phys 224—Modern Physics Laboratory—1 cr. (0 and 3)
Continuation of Phys 223. Experiments in the areas of solid state, optical and modern physics. Experiments are performed on electrical carrier mobility in solids, minority carrier lifetime, transistor action, microwave optics, interference and diffraction, light polarizaton, gas laser optics, optical spectra, electron and X-ray diffraction, radioactive particle counting. Compton scattering of X-rays, radioactivity decay and Mossbauer effect. *Prerequisite:* Registration in Phys 222 or 232.

Phys 231—General Physics for Physics Majors II—3 cr. (3 and 0)
A continuation of Phys 132. An introduction to the magnetic field, electric circuits, wave motion, reflection, refraction, diffraction of waves, electromagnetic waves. *Prerequisite:* Phys 132, registration in Phys 223.

Phys 232—General Physics for Physics Majors III—3 cr. (3 and 0)
A continuation of Phys 231. An introduction to thermodynamics, relativity, particle and wave descriptions of matter and light. Includes a description of experiments which were crucial to recent developments in physics. *Prerequisite:* Phys 231, registration in Phys 224.

Phys 304—Descriptive Astronomy—3 cr. (3 and 0)
The properties of the planets and their satellites, their actual and apparent motions; the properties of stars and galaxies; current theories and speculations. *Prerequisite:* Phys 202, 222 or 232.

Phys 321—Mechanics I—3 cr. (3 and 0)
Statics; motions of particles and rigid bodies; vibratory motion; gravitation; properties of matter, flow of fluids. *Prerequisite:* Phys 221 or 231.

PHYS 322—MECHANICS II—3 cr. (3 and 0)

Dynamics of particles and of rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. *Prerequisite:* Phys 321 or permission of instructor.

PHYS 325—EXPERIMENTAL PHYSICS I—4 cr. (2 and 6)

Introduction to laboratory techniques, measurement of fundamental constants, and performance of some of the experiments (Stern-Gerlach, Zeeman, Photoelectric, specific charge of electrons and protons, etc.) which are crucial to the development of our present concepts of physics. *Prerequisite:* Phys 321 or equivalent or enrollment in Phys 321 or by permission of the instructor.

PHYS 326—EXPERIMENTAL PHYSICS II—4 cr. (2 and 6)

Continuation of Phys 325.

PHYS 341—ELECTRICITY AND MAGNETISM—3 cr. (3 and 0)

Electric potential and electrostatic fields; solutions of Laplace's and Poisson's equations; properties of dielectrics and of capacitors; electrostatic energy; current and treatment of circuit problems. Vector analysis is used throughout after introduction. *Prerequisite:* Phys 221 or 231.

PHYS 401—SENIOR THESIS—3 cr. (1 and 6)

The senior thesis is a semi-original piece of work performed under the direction of a member of the physics staff. Theoretical fields available include relativity, statistical mechanics, nuclear physics and astrophysics. Experimental work may be done in the fields of X-ray diffraction elasticity, low-temperature thermal conductivity, super-conductivity, radiation damage in metals, and electron paramagnetic resonance. *Prerequisite:* At least three physics courses beyond General Physics.

PHYS 404—ASTRODYNAMICS—3 cr. (3 and 0)

Astronomical coordinate systems, orbit determinations, multiple body problems, perturbations, non-gravitational and relativistic effects and observational theory. Special attention to problems of artificial satellites. *Prerequisite:* Phys 321.

PHYS 432—PHYSICAL OPTICS AND INTODUCTION TO SPECTROSCOPY—3 cr. (3 and 0)

Theory and application of interference and diffraction phenomena, polarized light, magneto-optics and electro-optics. Introductory theory of spectroscopy. *Prerequisite:* Phys 222 or 232.

PHYS 441—ELECTRICITY AND MAGNETISM—3 cr. (3 and 0)

A continuation of Phys 341. Magnetic fields and energy; magnetic properties of materials; electromagnetic induction; A. C. circuit problems with vector methods and complex numbers; Maxwell's field equations with applications. *Prerequisite:* Phys 341 or equivalent.

PHYS 446—SOLID STATE PHYSICS—3 cr. (3 and 0)

An introductory treatment of the crystal structure of solids and the properties of solids which depend on crystal structure; free electron model of metals; band theory of solids; Brillouin zones, crystalline defects and diffusion. *Prerequisite:* Phys 222 or 232 or permission of instructor.

Phys 452—Introductory Nuclear Physics—3 cr. (3 and 0)
Various phases of nuclear physics including natural and induced radioactivity; properties of alpha, beta and gamma-rays; cosmic rays; nuclear energy levels and decay schemes; particle accelerators, fission, fusion and nuclear reactors. *Prerequisite:* Phys 222 or 232.

Phys 454—Nuclear Physics Laboratory—1 cr. (0 and 3)
Techniques and instruments used in detection and measurement of nuclear radiation. Experiments include half-life determination, absorption measurements, neutron activation, coincidence measurements, decay schemes, and gamma-ray spectroscopy. *Prerequisite:* Registration in Phys 452.

Phys 455—Quantum Physics I—3 cr. (3 and 0)
Discussion of solution of the Schroedinger equation for free particles, the hydrogen atom and the harmonic oscillator. *Prerequisite:* Phys 322 and 341 or permission of instructor.

Phys 456—Quantum Physics II—3 cr. (3 and 0)
Continuation of Physics 455. Application of principles of quantum mechanics as developed in Physics 455 to atomic, molecular, solid state and nuclear systems. *Prerequisite:* Phys 455.

Phys 460—Modern Physics for High School Teachers—3 cr. (3 and 0)
A study of later developments including the measurements of atomic particles. The formulation of new laws and the modifications of old ideas needed to describe the interactions of these particles.

Phys 465—Thermodynamics and Statistical Mechanics—3 cr. (3 and 0)
A study of temperature, development of the laws of thermodynamics and their application to thermodynamic systems. An introduction to low temperature physics is given. *Prerequisite:* Six hours of physics beyond Phys 222 or permission.

Phys 471—Electron Microscopy—3 cr. (2 and 3)
The theory and operation of the electron microscope. Magnetic lens theory. The technique of specimen mounting and the interpretation of electron micrographs and diffraction patterns. Each student may choose specimens from his major field. *Prerequisite:* General Physics, Math 206 and permission of instructor.

Phys 473—X-ray Crystallography—3 cr. (2 and 3)
A study of crystal symmetry, elementary space group theory, diffraction of X-rays by electronic charge distribution. Experimental methods of optical goniometry, powder diffraction and single crystal techniques are used to obtain diffraction intensities from a simple crystalline solid and electron charge distribution is determined. Applications of X-ray diffraction to chemical, physical and metallurgical investigations are discussed.

Phys 621—Mechanics I—3 cr. (3 and 0)

Phys 622—Mechanics II—3 cr. (3 and 0)

Phys 625—Experimental Physics I—4 cr. (2 and 6)

Phys 626—Experimental Physics II—4 cr. (2 and 6)

Phys 641—Electricity and Magnetism—3 cr. (3 and 0)

PHYS 704—ASTRODYNAMICS—3 cr. (3 and 0)

PHYS 732—PHYSICAL OPTICS AND INTRODUCTION TO SPECTROSCOPY—3 cr. (3 and 0)

PHYS 741—ELECTRICITY AND MAGNETISM—3 cr. (3 and 0)

PHYS 746—SOLID STATE PHYSICS—3 cr. (3 and 0)

PHYS 752—INTRODUCTORY NUCLEAR PHYSICS—3 cr. (3 and 0)

PHYS 755—QUANTUM PHYSICS I—3 cr. (3 and 0)

PHYS 756—QUANTUM PHYSICS II—3 cr. (3 and 0)

PHYS 760—MODERN PHYSICS FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 765—THERMODYNAMICS AND STATISTICAL MECHANICS—3 cr. (3 and 0)

PHYS 771—ELECTRON MICROSCOPY—3 cr. (2 and 3)

PHYS 773—X-RAY CRYSTALLOGRAPHY—3 cr. (2 and 3)

PHYS 801—PHYSICS FOR HIGH SCHOOL TEACHERS I—3 cr. (3 and 0)

PHYS 802—PHYSICS FOR HIGH SCHOOL TEACHERS II—3 cr. (3 and 0)

PHYS 804—ASTRONOMY FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 811—METHODS OF THEORETICAL PHYSICS I—3 cr. (3 and 0)

PHYS 812—METHODS OF THEORETICAL PHYSICS II—3 cr. (3 and 0)

PHYS 813—THERMODYNAMICS AND STATISTICAL MECHANICS—3 cr. (3 and 0)

PHYS 821—CLASSICAL MECHANICS I—3 cr. (3 and 0)

PHYS 822—CLASSICAL MECHANICS II—3 cr. (3 and 0)

PHYS 841—ELECTRODYNAMICS I—3 cr. (3 and 0)

PHYS 842—ELECTRODYNAMICS II—3 cr. (3 and 0)

PHYS 845—SOLID STATE I—3 cr. (3 and 0)

PHYS 846—SOLID STATE II—3 cr. (3 and 0)

PHYS 853—NUCLEAR PHYSICS I—3 cr. (3 and 0)

PHYS 854—NUCLEAR PHYSICS II—3 cr. (3 and 0)

PHYS 856—CRYSTALLOGRAPHY—3 cr. (3 and 0)

PHYS 875—SEMINAR IN CONTEMPORARY PHYSICS—1 or 2 or 3 cr. (1 or 2 or 3 and 0)

PHYS 885—COLLOQUIUM—1 cr. (1 and 0)

PHYS 891—RESEARCH—Credit to be arranged.

PHYS 922—HYDRODYNAMICS—3 cr. (3 and 0)

PHYS 951—QUANTUM MECHANICS I—3 cr. (3 and 0)

PHYS 952—QUANTUM MECHANICS II—3 cr. (3 and 0)

PHYS 955—ADVANCED MODERN PHYSICS I—3 cr. (3 and 0)

PHYS 956—ADVANCED MODERN PHYSICS II—3 cr. (3 and 0)

PHYS 966—RELATIVITY—3 cr. (3 and 0)

PHYS 991—DOCTORAL RESEARCH AND DISSERTATION—Credit to be arranged.

PLANT PATHOLOGY

Professor: W. M. Epps, *Head*

Associate Professors: L. W. Baxter, J. E. Halpin, G. C. Kingsland, W. Witcher

Assistant Professors: O. W. Barnett, E. I. Zehr

Lecturer: W. W. Dowler[*]

Pl Pa 401—Plant Pathology—3 cr. (2 and 3) F, S

The principles of the interrelationships between plant pathogens, their hosts, and the environment. Economically important plant diseases are used to illustrate these principles and the application of these principles to disease control. *Prerequisite:* Bot 101.

Pl Pa H401—Plant Pathology—3 cr. (2 and 3) F, S

Honors option for Pl Pa 401, admission by special arrangement.

Pl Pa 405—Forest Pathology—3 cr. (2 and 3) F

Principles of plant pathology as related to forest tree diseases; casual agents and their effects on the suspect; prevention and control and minimizing losses; relation of disease control to silviculture, management, and forest products utilization. *Prerequisite:* Bot 101 and Bot 352 or permission of instructor.

Pl Pa H405—Forestry Pathology—3 cr. (2 and 3) F

Honors option for Pl Pa 405, admission by special arrangement.

Pl Pa 456—Plant Virology—3 cr. (3 and 0) S, '72 and alternate years

Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector relationships; and serological procedures. The importance and control of plant virus diseases will be discussed. *Prerequisite:* Bot 101.

Pl Pa H456—Plant Virology—3 cr. (3 and 0) S, '72 and alternate years

Honors option for Pl Pa 456, admission by special arrangement.

Pl Pa 458—Plant Parasitic Nematodes—3 cr. (2 and 3) F, '70 and alternate years.

Morphology and taxonomy of stylet bearing nematodes and their relationship with plant diseases. *Prerequisite:* Bot 101 and Zool 101 and 103.

Pl Pa H458—Plant Parasitic Nematodes—3 cr. (2 and 3) F, '70 and alternate years.

Honors option for Pl Pa 458, admission by special arrangement.

Pl Pa 701—Plant Pathology—3 cr. (2 and 3)

Pl Pa 705—Forest Pathology—3 cr. (2 and 3)

Pl Pa 756—Plant Virology—3 cr. (3 and 0)

Pl Pa 758—Plant Parasitic Nematodes—3 cr. (2 and 3)

Pl Pa 802—Control of Plant Diseases—3 cr. (3 and 0)

Pl Pa 803—Plant Pathology—3 cr. (2 and 3)

Pl Pa 804—Physiological Plant Pathology—3 cr. (3 and 0)

Pl Pa 805—Special Problems in Plant Pathology—Credit to be arranged.

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[*] On leave.

Pl Pa 807—Seminar—1 cr. (1 and 0)

Pl Pa 891—Research—Credit to be arranged.

Pl Pa 991—Doctoral Research—Credit to be arranged.

POLITICAL SCIENCE

Associate Professor: J. E. Tuttle

Assistant Professors: W. H. Owens, Jr., J. W. Witt

Instructors: R. A. Fredland, M. W. Slann

Pol Sc 101—Introduction to Political Science I, American Government—3 cr. (3 and 0)

A general introduction to public administration, political behavior, and public law, with a concentrated treatment of American institutions. (Formerly Pol Sc 202.)

Pol Sc 201—Introduction to Political Science II—3 cr. (3 and 0)

A basic introduction to the study, analysis, scope, and sources of government. Emphasis is given to the comparative institutions of government, the international relations of government, the theoretical conceptions man has entertained about government, and analysis of the ways in which man has behaved in response to government. *Prerequisite:* Pol Sc 101 (or 202 or 301) or permission of instructor.

Pol Sc 301—American Government and Political Parties—3 cr. (3 and 0)

The Constitution: powers and functions of the governmental activities; political parties and elections. Not open to those who have completed Pol Sc 101 or 202.

Pol Sc 302—State and Local Government—3 cr. (3 and 0)

The structural features, functions, and legislative, executive and judicial processes of American state and local governments.

Pol Sc 321—General Public Administration—3 cr. (3 and 0)

An introduction to public administration including the elements of organization, personnel and financial management, and administrative law and administrative responsibility. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 331—Constitutional Development of the United States—3 cr. (3 and 0)

The origin and growth of the Constitution of the United States. *Prerequisite:* Pol Sc 101 (or 201 or 202).

Pol Sc 341—Political Behavior—3 cr. (2 and 3)

An introduction to behavioral methods. Identification of regularities in the type, degree, and direction of political participation. Laboratory training and field work in interviewing. *Prerequisite:* Junior standing and permission of instructor.

Pol Sc 351—Classical Political Thought—3 cr. (3 and 0)

Political philosophy from the pre-Socratic period to Machiavelli. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 352—Modern Political Thought—3 cr. (3 and 0)

The early theories of the nation state in the sixteenth century and the major political thinkers, problems and movements through the twentieth century. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 361—International Politics—3 cr. (3 and 0)

An introduction to foreign policy, international law, and international organizations. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 371—Comparative European Governments I; Constitutional Systems—3 cr. (3 and 0)

Major emphasis on the United Kingdom, France, Germany, and the U.S.S.R., with brief attention given to Italy and Switzerland. Current methods of comparison will be studied and applied to the formal and informal functioning of these governments. *Prerequisite:* Pol Sc 201, 202.

Pol Sc 372—Comparative European Government II; Totalitarian Systems—3 cr. (3 and 0)

A continuation of Pol Sc 371. This course will deal specifically with the Soviet Union as an example of totalitarian political systems, with references made to Nazi Germany and the present Eastern European political systems. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 403—Legislative Process—3 cr. (3 and 0)

Individual behavior and the decision-making process within legislatures; legislative functions; the relationship of legislatures to the Executive and other entities in the political system. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 409—Directed Study in American Institutions—3 cr. (3 and 0)

Supervised reading and/or research in selected areas of American government. *Prerequisite:* 18 semester hours in political science and permission of the instructor.

Pol Sc 432—American Constitutional Law I—3 cr. (3 and 0)

A brief introduction to the judicial process followed by a detailed examination of leading cases pertaining to the Judiciary, the Congress, the Presidency, and the federal system. *Prerequisite:* Pol Sc 101 (or 202 or 301), 201, and preferably 331.

Pol Sc 433—American Constitutional Law II—3 cr. (3 and 0)

An examination of the relationship of the individual to his government; focusing on the safeguards of liberty and property including freedoms of speech. press and religion, and criminal procedure. *Prerequisite:* Pol Sc 101 (or 202 or 301), 201, and preferably 331.

Pol Sc 434—The Judicial Process and Jurisprudence—3 cr. (3 and 0)

Courts as political subsystems; judicial decision-making; the development of public policy through the judicial process; theories of law and jurisprudence. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 442—Political Parties and Politics—3 cr. (3 and 0)

A study of the historical development of political parties, and the role they play in the organization and functions of our national government, and the influence of politics in policy making. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 443—Public Opinion and Propaganda—3 cr. (3 and 0)
This course examines the nature of public opinion, its social and political context, the social-psychological processes basic to it, the dynamics of its formation and change and its measurement. *Prerequisite:* Pol Sc 341, IM 410, or permission of the instructor.

Pol Sc 462—International Organizations—3 cr. (3 and 0)
Emphasis on international organizations. Analysis of current problems and proposed solution. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 463—United States Foreign Policy—3 cr. (3 and 0)
Focus on foreign policy in its historical perspective, examining the decision-making process in foreign policy; evaluates contemporary American capabilities, and analyzes specific issues. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 464—International Law—3 cr. (3 and 0)
An examination of cases and other legal materials on the nature of international law, recognition of states, succession, the territory of states, and nationality. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 469—Proseminar in International Studies—3 cr. (3 and 0)
Assessment of various theories and methods employed in the systematic study of International Relations; class discussions, readings, and reports. Required of International Studies majors. *Prerequisite:* For International Studies majors, senior standing and 24 hours toward the major; for others, Pol Sc 101, 201, and permission of the instructor.

Pol Sc 473—Politics of the Developing Nations—3 cr. (3 and 0)
A comparative analysis of the political and social problems of the developing nations of Africa, the Near East, East Asia and Latin America. *Prerequisite:* Pol Sc 101 and 201 or permission of the instructor.

Pol Sc 732—American Constitutional Law I—3 cr. (3 and 0)

Pol Sc 762—International Organizations—3 cr. (3 and 0)

POULTRY SCIENCE

Professors: B. D. Barnett, *Head;* M. A. Boone
Associate Professors: J. B. Cooper, D. E. Turk
Assistant Professors: J. E. Jones, J. Solis

PS 201—Introduction to Poultry Science—3 cr. (2 and 3) F, S
The application of the physical and biological sciences to modern poultry production and utilization. A study of the anatomy and physiology of the fowl and the economic aspects of poultry enterprises.

PS 354—Poultry Breeding—3 cr. (2 and 3) S, '72 and alternate years.
The application of genetics to the improvement of poultry and a study of the physiology related to breeding. *Prerequisite:* Gen 302.

PS 355—Poultry Products Grading and Technology—3 cr. (2 and 3) F, '71 and alternate years.
Factors important in the quality of poultry products will be considered. The effects of production, handling, packaging and storage on consumer acceptability will be discussed. Quality evaluation will be considered from the standpoint of tenderness, flavor, microbiology, and USDA grades.

PS 356—INCUBATION AND BROODING—2 cr. (2 and 0)
F, '70 and alternate years.

Principles and practice of incubation of chicken and turkey eggs with consideration of hatchery management and embryology of the chick.

PS 358—INCUBATION AND BROODING LABORATORY—1 cr. (0 and 3)
F, '70 and alternate years.

Demonstration of subjects covered in PS 356. Must be concurrently enrolled in PS 356.

PS 401—ANIMAL ENVIRONMENTAL TECHNOLOGY—2 cr. (2 and 0)
F, '70 and alternate years.

Demonstration of measurement and control of certain environmental factors with emphasis on light, temperature, and atmospheric gases. Demonstration of physiological response of animals to different environments. All domestic livestock will be considered.

PS 403—ANIMAL ENVIRONMENTAL TECHNOLOGY LABORATORY—1 cr. (0 and 3) F, '70 and alternate years.

Demonstration of subjects covered in PS 401.

PS 451—POULTRY NUTRITION—2 cr. (2 and 0) S, '72 and alternate years.

Nutrient requirements of the various classes of poultry and the use of feedstuffs in meeting these needs. *Prerequisite:* An Sc 301.

PS 458—AVIAN MICROBIOLOGY AND PARASITOLOGY—4 cr. (3 and 3)
F, '70 and alternate years.

Agents causing poultry diseases; the diagnosis, prevention, and treatment of specific diseases and their economic and public health significance.

PS 460—SEMINAR—2 cr. (2 and 0) S, '71 and alternate years.

Current research reported in journals covering the various areas of poultry science. Students will practice scientific writing and interpretation of technical material for lay readers. *Prerequisite:* Permission of instructor.

PS 654—POULTRY BREEDING—3 cr. (2 and 3)

PS 655—POULTRY PRODUCTS GRADING AND TECHNOLOGY—3 cr. (2 and 3)

PS 656—INCUBATION AND BROODING—2 cr. (2 and 0)

PS 658—INCUBATION AND BROODING LABORATORY—1 cr. (0 and 3)

PS 701—ANIMAL ENVIRONMENTAL TECHNOLOGY—2 cr. (2 and 0)

PS 703—ANIMAL ENVIRONMENTAL TECHNOLOGY LABORATORY—1 cr. (0 and 3)

PS 751—POULTRY NUTRITION—2 cr. (2 and 0)

PS 758—AVIAN MICROBIOLOGY AND PARASITOLOGY—4 cr. (3 and 3)

PS 760—SEMINAR—2 cr. (2 and 0)

PS 801—POULTRY NUTRITION AND METABOLISM—3 cr. (2 and 3)

PS 804—POULTRY PATHOLOGY—3 cr. (1 and 6)

PS 805—SEMINAR—1 cr. (1 and 0)

PS 891—RESEARCH—Credit to be arranged.

PSYCHOLOGY

Associate Professors: J. D. Davenport, E. E. Waite, Jr.

Assistant Professors: C. B. Caffrey, S. N. Cole, W. B. Turpin

Instructor: R. Lawson

Lecturer: D. K. Freeman, Jr.

Psych 201—General Psychology—3 cr. (3 and 0)
A survey of the field of psychology: development and adjustment, motivation, emotions, intelligence, personality, the sensory experiences, perception, learning, thinking, imagination and mental hygiene.

Psych 202—Experimental Psychology I—3 cr. (2 and 2)
This course places emphasis on theoretical and practical problems of reporting research. Required of psychology majors (and minors after May, 1969). Not open to those who have had Psych 362. *Prerequisite:* Psych 201.

Psych 211—Growth and Development—3 cr. (3 and 0)
The course will focus on changes in personal and social behavior throughout the human life span. *Prerequisite:* Psych 201.

Psych 302—Social Psychology—3 cr. (3 and 0)
The interaction between the individual and the forces of society: the classical theories, the psychobiological bases of human behavior, the sociocultural bases of behavior, types of human behavior, overt and convert experiences, symbolism, personality and social interaction. *Prerequisite:* Psych 201.

Psych 303—The Psychology of Adjustment—3 cr. (3 and 0)
A course in personal adjustment dealing with the appropriate and inappropriate reactions to frustration and stress, including ways of handling conflicts, anxiety, fears, and the promotion of personal emotional adjustment. *Prerequisite:* Psych 201, 202, or permission of instructor. Not open to psychology majors.

Psych 321—Developmental Psychology—3 cr. (3 and 0)
A survey of current theory and research concerned with the psychological aspects of human growth and development. *Prerequisite:* Psych 201, 202.

Psych 331—Theories of Learning—3 cr. (3 and 0)
An historical approach to the study of the major modern learning theories. *Prerequisite:* Psych 201, 202.

Psych 341—Physiological Psychology—3 cr. (3 and 0)
The study of human neuroatomy, with an emphasis on the functions of the nervous system. Treats of the biological bases of behavior in both normal and abnormal dimensions.

Psych 351—History and Systems of Psychology—3 cr. (3 and 0)
A treatment of the science of psychology as understood in the light of the ideas of men who have been responsible for its development. *Prerequisite:* Psych 201, 202.

Psych 361—Motivation—3 cr. (3 and 0)
The various aspects of motivation are considered through a study of contributions of biologists, sociologists, anthropologists, and psychologists. The orientation is empirical rather than theoretical, with emphasis on pertinent research and research methods, and on the measurement of motives. *Prerequisite:* Psych 201, 202.

PSYCH 363—EXPERIMENTAL PSYCHOLOGY II—4 cr. (3 and 3)

A continuation of Experimental Psychology I, with a stress on the carrying out of original research in the scientific study of human and animal behavior. Laboratory periods stress the refinement of techniques and the execution of research in a guided setting. *Prerequisite:* Psych 201, 202.

PSYCH 401—APPLIED PSYCHOLOGY—3 cr. (3 and 0)

A study of the concepts of psychology as applied to individual, business, and professional behavior. *Prerequisite:* Psych 201.

PSYCH 402—ABNORMAL PSYCHOLOGY—3 cr. (3 and 0)

Mental and emotional disorders: theories of causation and problems of treatment; special phenomena of consciousness and unconsciousness, *e.g.*, dreams, dissociation, hypnosis; analysis of pathological behavior: alcoholism, drug addiction, suicide, criminality, neurosis, and psychoneurosis. *Prerequisite:* Psych 201.

PSYCH 403—PERSONALITY—3 cr. (3 and 0)

An analysis of the theories of personality: Freud, Adler, Jung, Sullivan, Horney, Allport, *et al.* *Prerequisite:* Psych 201, 202 and permission of instructor.

PSYCH 422—CROSS CULTURAL STUDIES IN DEVELOPMENTAL PSYCHOLOGY—3 cr. (3 and 0)

A comparative study of the development of human behavior and personality emphasizing the contributions of learning theory, psychoanalysis, role theory, and cultural anthropology. *Prerequisite:* Psych 201, 202, 321, 331 or 361, 402 or 403, or permission of the instructor.

PSYCH 432—CONDITIONING AND LEARNING—3 cr. (3 and 0)

A comprehensive study of the principles of learning. Includes classical, instrumental, and operant conditioning paradigms. A detailed study of reinforcement, acquisition, generalization, discrimination, and extinction of behavioral responses. *Prerequisite:* Psych 201, 202, 331, Math 203.

PSYCH 442—PSYCHOLOGY OF SENSATION AND PERCEPTION—3 cr. (3 and 0)

Current experimental findings in the field of perception and sensation, along with theories of vision, audition, kinesthesis, vestibular function, the skin and chemical senses and theories of perception. *Prerequisite:* Psych 201, 202 and 341.

PSYCH 471—PSYCHOMETRICS—3 cr. (3 and 0)

An introduction to the theory of psychological testing. Emphasis is on essentials of testing with experience in administering, scoring and interpreting test, including those of scholastic achievement, mental ability, scholastic aptitude, interests and personality. *Prerequisite:* Nine hours of psychology including 201, 202).

PSYCH 490—SPECIAL TOPICS IN PSYCHIATRY AND NEUROLOGY, 3 cr. (3 and 0)

Selected aspects of medical sciences related to clinical psychology—psychiatric examination and nosology, central nervous system pathology, psychopharmocology, child psychiatry, etc.—designed to assist the psychologist in working effectively with representatives of these disciplines. *Prerequisite:* Psych 201. 202, 402, 403 and/or permission of the instructor.

PSYCH 498—SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY—2 cr. (2 and 0)
Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, and 363 or permission of the instructor.

RECREATION AND PARK ADMINISTRATION

Associate Professor: H. BRANTLEY, *Head*

Assistant Professor: R. M. FRYE, L. W. GAHAN, G. E. HOWARD, M. O. KEITH, J. R. SELLERS, J. L. STEVENSON, SARAH A. WALKER

RPA 101—INTRODUCTION TO COMMUNITY RECREATION—3 cr. (3 and 0)
History and foundations of Community Recreation in public, private and commercial settings; job opportunities, specifications and demands.

RPA 102—HISTORY AND PRINCIPLES OF OUTDOOR RECREATION—3 cr. (3 and 0)
Includes the study of the history, present status and the principles of operation of parks and park systems in America; Outdoor Education Programs; implications for continued growth of this leisure phenomenon.

RPA 202—MANAGEMENT OF AQUATIC FACILITIES—2 cr. (2 and 0)
Includes the organization of water safety programs and the maintenance of swimming pools and lake front facilities. Also trends and growth patterns of water-based recreation.

RPA 203—PERSONAL AND COMMUNITY HEALTH—3 cr. (3 and 0)
The course deals with health problems, disease prevention and control, school health practices, public health administration, and other health information which may enable one to live intelligently in today's complex society.

RPA 204—SPORTS IN RECREATION—3 cr. (2 and 3)
Administrative and supervisory skills indigenous to public and/or private agency athletic programs are considered. Group instruction is given in individual and team sports and officiating techniques applicable to these sports are taught.

RPA 205—PROGRAM PLANNING FOR RECREATION—3 cr. (2 and 3)
Course includes fields of activity available to participants; principles and methods of program development; utilization of time-blocks and facilities. (Formerly RPA 303.) *Prerequisite:* Junior standing.

RPA 302—CAMP ORGANIZATION AND ADMINISTRATION—3 cr. (2 and 3)
Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables student to master the techniques of group living. Laboratory offers practical experience in camp craft including trips and outdoor cooking.

RPA 304—RECREATION IN MODERN SOCIETY—3 cr. (3 and 0)
An historical study of the growth of leisure with special attention given to the utilization of community resources for recreation.

RPA 305—PHYSICAL ASPECTS OF SPORTS IN RECREATION—3 cr. (2 and 3)
The course considers the physiology of exercise as it relates to safety in recreational sports programs, the practice of first aid, and the treatment of athletic injuries.

RPA 306—PRINCIPLES OF OUTDOOR EDUCATION—3 cr. (3 and 0)
A study of the development of outdoor education in public, private and professional agencies with special emphasis on schools and park and recreation departments. Attention will be focused on our National land problems and on land needs for tomorrow.

RPA 307—PARK MAINTENANCE AND OPERATION—4 cr. (3 and 3)
Maintenance techniques and materials, interpretive programs, job planning and scheduling, problems of overuse and preventive maintenance are included. (Formerly RPA 401.)

RPA 308—METHODS AND TECHNIQUES OF RECREATION LEADERSHIP—3 cr. (3 and 0)
Considers characteristics of the several levels of recreation leadership with special emphasis on supervision. Examination is made of the Group Processes. Also includes a study of community resources for leadership in specialized program areas.

RPA 402—RECREATION ADMINISTRATION—3 cr. (3 and 0)
An analysis of the internal organization of a recreation department dealing with finances and accounting; records and reports; publicity and public relations; state and federal legislation; staff organization; coordination of community resources. *Prerequisite:* Senior standing.

RPA 403—FACILITY AND SITE PLANNING—3 cr. (2 and 3)
Trends in recreation facility development, planning principles involved in design of recreation buildings, and orientation of facilities to given area are integrated into sound planning programs. *Prerequisite:* RPA 307 or permission of instructor.

RPA 404—METHODS OF RECREATION RESEARCH—3 cr. (3 and 0)
An analysis of the principal methods of recreation research; the development of experiments; use of questionnaires; research problem under the guidance of the instructor is developed. *Prerequisite:* Senior standing and Ed 491.

RPA 405—FIELD TRAINING IN RECREATION—8 cr.
The student, in a ten-week program, has the opportunity to observe recreation programs in operation. He will also have responsibilities of organizing and conducting activities under supervision. Maintenance and operation of facilities will be observed and practiced. Total of 360 hours required. *Prerequisite:* Senior standing.

RPA 406—RECREATION FOR THE ILL AND HANDICAPPED—3 cr. (3 and 0)
Surveys the recreational opportunities and benefits available to the ill and handicapped citizens. Designed to provide the student with an awareness of the role of the professional recreator in serving the needs of such special groups as the mentally retarded, cerebral palsied, emotionally disturbed—institutionalized, hospitalized, etc. Particular emphasis will be given to program development applicable to each specific situation.

RPA 408—THE APPLICATION OF RECREATION THERAPY—3 cr. (3 and 0)
The study of the responsibility and role of the recreator as a member of the therapeutic team.

RELIGION

Assistant Professors: R. B. Harris, D. F. White, Jr.

Rel 301—The Old Testament—3 cr. (3 and 0)

A survey of books of the Old Testament wth special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

Rel 302—A Survey of New Testament Literature—3 cr. (3 and 0)

A study of the books of the New Testament from the standpoint of their occasion, content, literary form and basic theology.

Rel 306—Religions of the West—3 cr. (3 and 0)

A study of the origin, evolution, and contemporary status of Judaism, Christianity, and Islam. *Prerequisite:* Junior standing.

Rel 309—Religions of the Far East—3 cr. (3 and 0)

A study of the origin, evolution, and contemporary status of Hinduism, Buddhism, Confucianism, and Taoism. *Prerequisite:* Junior standing.

RURAL SOCIOLOGY

Professor: W. J. Lanham, *Head*

Associate Professor: V. A. Boyd

RS 301—Rural Sociology—3 cr. (3 and 0) F, S

A study of human social relationships as influenced by life in the open country and in small towns and villages including considerations of the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

RS 359—The Community—3 cr. (3 and 0) F

An examination of the sociological aspects of contemporary communities and of their growth and development. The structural relations of social class, status and power and the relationships among social institutions within the community are examined. Emphasis is placed on the organization and development of communities in a constantly changing environment.

RS 461—Rural Leadership—3 cr. (3 and 0) S

A consideration of the social and psychological factors involved in leadership including an examination and analysis of characteristics of the successful leader. Particular attention is paid to the role of the leader in the process of economic and social development of rural communities and small towns.

RS 659—The Community—3 cr. (3 and 0)

RS 761—Rural Leadership—3 cr. (3 and 0)

RS 801—Rural Social Systems—3 cr. (3 and 0)

RUSSIAN

Lecturer: Ludmila A. Savitsky

Russ 101—Elementary Russian—3 cr. (3 and 1)

Training in pronunciation, grammatical forms, and syntax with a view of giving the student the fundamentals necessary to read simple Russian texts.

Three hours a week classroom instruction and one hour a week in the language laboratory.

Russ 102—Elementary Russian—3 cr. (3 and 1)

A continuation of Russ 101; three hours a week classroom instruction and one hour a week in the language laboratory.

Russ 201—Intermediate Russian—3 cr. (3 and 1)

The reading of simple Russian prose; a review of grammar and syntax. Drill on vocabulary and idiom. Three hours a week classroom instruction and one hour a week in the language laboratory. *Prerequisite:* Russ 101 and 102.

Russ 202—Intermediate Russian—3 cr. (3 and 0)

A continuation of Russ 201.

SOCIOLOGY

Professor: F. A. Burtner

Assistant Professors: W. C. Capel, Jr.,[*] W. B. Horton, Jr., R. J. Knapp

Instructors: K. D. Birtman, J. L. DeGregory, J. R. Doggette

Soc 201—Introductiory Sociology—3 cr. (3 and 0)

The basic principles of sociology: culture, biological factors, the influence of geographical environment, human nature, group life, social stratification, communities, social institutions and social change. *Prerequisite:* Sophomore standing.

Soc 202—Social Problems—3 cr. (3 and 0)

A survey of the major social problems, including problems of industry, education, religion, disease and public health, poverty, dependency and factors affecting social adjustment. Required of all students presenting Sociology as the primary or secondary field of concentration. *Prerequisite:* Soc 201.

Soc 311—The Family—3 cr. (3 and 0)

The family as one of the basic institutions of society. The history of the family, and a study of its functions in early and modern social structures. A comparative study of family life in other cultures is made. *Prerequisite:* Soc 201, 202.

Soc 321—Cultural Anthropology—3 cr. (3 and 0)

Recent and contemporary man, as a social and culture-bearing animal, with emphasis on the constants and variants in human behavior involved in technology, social relations, language, religion, art, and other aspects of cultures. *Prerequisite:* Soc 201, 202.

Soc 322—Cultural Anthropology—3 cr. (3 and 0)

A continuation of Sociology 321. *Prerequisite:* Soc 321.

Soc 324—Social and Cultural Change—3 cr. (3 and 0)

An examination of theory and research on the processes of change; factors inducing or inhibiting change; the character, mechanisms, rate, extent, direction, and relative stabilization of change at different levels of social phenomena. *Prerequisite:* Soc 201, 202.

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[*] On leave.

Soc 331—Urban Sociology—3 cr. (3 and 0)
A survey of the history and development of modern urban organization; rise of the city; problems of modern urban life. *Prerequisite:* Soc 201, 202 (for Sociology majors and minors).

Soc 341—Population Analysis—3 cr. (3 and 0)
An analysis of population growth and distribution and their bearing on current economic, political, and social problems. *Prerequisite:* Soc 201, 202.

Soc 351—Industrial Sociology—3 cr. (3 and 0)
Industry as a social organization; the factory as a social system; personality in industrial relations; power groupings within industry; and industry and the community. *Prerequisite:* Soc 201 and permission of the instructor.

Soc 361—Collective Behavior—3 cr. (3 and 0)
Examination of the nature, development and consequences of human behavior in situations where usual social norms and behavior do not apply. Particular attention to such collective behavior phenomena as crowds, mobs, mass, cults, publics, and the initial states of social movements. *Prerequisite:* Soc 201, 202.

Soc 371—Research Methods—3 cr. (3 and 0)
Analysis of scientific methods in social research and consideration of various techniques, methodological approaches and research designs. *Prerequisite:* Soc 201, 202, Math 203.

Soc 381—Society and Socialization—3 cr. (3 and 0)
The relationship between social structure and personality. *Prerequisite:* Soc 201, 202.

Soc 391—Sociology of Deviant Behavior—3 cr. (3 and 0)
Analysis of advanced theory and research on the social processes by which behavior becomes defined as deviant, the conditions promoting such behavior, and the career patterns of deviant persons. *Prerequisite:* Soc 201, 202.

Soc 411—Classical Sociological Theory—3 cr. (3 and 0)
A survey of sociological theory from Comte to Durkheim. Required of all sociology majors. *Prerequisite:* 9 semester hours in sociology.

Soc 421—Contemporary Sociological Theory—3 cr. (3 and 0)
A survey of sociological theory from Durkheim to the present. Required of all sociology majors. *Prerequisite:* Soc 201, 202, 411.

Soc 431—Complex Organizations—3 cr. (3 and 0)
An examination and comparison of theories of formal organization; and analysis of the structure and function of specific organizations illustrating various theoretical approaches. *Prerequisite:* Soc 201, 202.

Soc 441—Social Stratification—3 cr. (3 and 0)
Analysis of social structure in terms of class, status, prestige, rank and function. Attention is given to the social role of the elite, bureaucracies, the professional, and middle classes. *Prerequisite:* Soc 201, 202.

Soc 451—Sociology of Medicine—3 cr. (3 and 0)
Consideration of the major contributions of sociology to medicine; an exploration of patterned social relationships in the field of health and medicine. *Prerequisite:* Soc 201, 202.

Soc 481—Race Relations—3 cr. (3 and 0)

The study of the problem of racial and ethnic groups in adjusting to American society. The nature and causes of prejudice and discrimination. Programs for the reduction of intergroup tensions and conflicts are evaluated in the light of observed facts and sociological principles. *Prerequisites:* Soc 201, 202 (or permission of the instructor).

Soc 499—Seminar in Selected Topics in Contemporay Sociology—3 cr. (3 and 0)

Required of all sociology majors. *Prerequisite:* Soc 201, 202, 411, 421, or permission of senior adviser.

Soc 711—History of Social Thought—3 cr. (3 and 0)

Soc 721—Sociological Theory—3 cr. (3 and 0)

Soc 731—Complex Organizations—3 cr. (3 and 0)

Soc 741—Social Stratification—3 cr. (3 and 0)

Soc 751—Sociology of Medicine—3 cr. (3 and 0)

SPANISH

Assistant Professors: G. J. Fernandez, R. F. Mixon, J. M. Whitmire

Instructors: B. G. Durham, P. F. Parrado, L. T. Perry, Michele H. Risko, L. E. Seamon

Lecturer: Elena G. Fernandez

Span 101—Elementary Spanish—3 cr. (3 and 1)

A course for beginners in which the essentials of grammar are taught and a foundation is provided for a conversational and reading knowledge of the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Span 102—Elementary Spanish—3 cr. (3 and 1)

A continuation of Span 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

Span 201—Intermediate Spanish—3 cr. (3 and 1)

Grammar, vocabulary, and idioms; conversation, composition, and translation. Three hours a week classroom instruction and one hour a week in the language laboratory. *Prerequisite:* Span 102.

Span 202—Intermediate Spanish—3 cr. (3 and 0)

Introduction to Spanish literature: representative short stories, essays, novels, poetry, and plays. *Prerequisite:* Span 201.

Span 303—Survey of Spanish Literature I—3 cr. (3 and 0)

Literary movements, influences, and authors from the beginnings to the end of the seventeenth century. Representative works, discussions. Required of Spanish majors. *Prerequisite:* Span 201 and 202.

Span 304—Survey of Spanish Literature II—3 cr. (3 and 0)

Literary movements, influences, and authors from the eighteenth century to the present. Required of Spanish majors. *Prerequisite:* Span 303.

SPAN 305—CONVERSATIONAL SPANISH—3 cr. (3 and 0)
Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Some written work to increase accuracy. Required of Spanish majors. Assignments in the language laboratory. *Prerequisite:* Span 201 and 202.

SPAN 306—ADVANCED CONVERSATION AND COMPOSITION—3 cr. (3 and 0)
A continuation of Span 305 with more emphasis on written Spanish. Required of Spanish majors. *Prerequisite:* Span 305.

SPAN 401—CONTEMPORARY SPANISH LITERATURE—3 cr. (3 and 0)
Literary trends and representative authors since 1898. *Prerequisite:* Span 303 and 304.

SPAN 402—CONTEMPORARY SPANISH DRAMA—3 cr. (3 and 0)
The Spanish theater from Benavente to the present. *Prerequisite:* Span 303 and 304.

SPAN 405—NINETEENTH CENTURY SPANISH LITERATURE—3 cr. (3 and 0)
Representative authors and movements of the nineteenth century; romanticism, *costumbrismo,* and the regional novel. *Prerequisite:* Span 303 and 304.

SPAN 406—CERVANTES AND THE GOLDEN AGE—3 cr. (3 and 0)
A study of Cervantes and the theater of the Golden Age of Spanish literature. *Prerequisite:* Span 303 and 304.

TECHNICAL OPERATIONS

Professor: E. LAITALA, *Program Director*

TO 301—MECHANICS I—3 cr. (3 and 0)
A study of statics including force systems and friction. dynamics of particles and rigid bodies; and, kinetics including forces, mass and acceleration, work and energy, impulse and momentum. *Prerequisite:* Phys 202, concurrent registration in Math 206.

TO 302—MECHANICS II—3 cr. (3 and 0)
Mechanical properties of solids and fluids. Stress analysis in solids; beams, columns and cylinders. Hydrostatic systems. Energy and flow characteristics of fluid dynamic systems. *Prerequisite:* TO 301.

TO 311—ELECTRICAL CIRCUITS I—3 cr. (3 and 0)
Complete sinusoidal circuit analysis with emphasis on circuit components, power, frequency response, steady-state conditions, and theorems. S-plane plots and Z(S) functions incorporated throughout for later coverage of Laplace transformation. *Prerequisite:* Phys 202, concurrent registration in Math 206.

TO 312—ELECTRICAL CIRCUITS II—3 cr. (3 and 0)
Continuation of Electrical Circuits I. Coverage includes circuit response to non-sinusoidal excitations, transient analysis by the Laplace transformation, and a study of polyphase circuits. *Prerequisite:* TO 311.

TO 321—HEAT POWER I—3 cr. (3 and 0)
First and second laws of thermodynamics, thermodynamic properties, gas mixtures and thermodynamic processes. *Prerequisite:* Phys 202, concurrent registration, Math 206.

TO 322—HEAT POWER II—3 cr. (3 and 0)
Internal combustion engines, gas turbines, air compressors, flow in nozzles, refrigeration and steam power plant cycles, and heat transfer. *Prerequisite:* TO 321.

TO 331—HEAT POWER LABORATORY—1 cr. (0 and 3)
The course is intended to illustrate theory covered in heat power and in air conditioning; to develop experimental technique; to interpret data and results; and to develop basic skills in technical report writing. *Prerequisite:* TO 321 and registration in TO 322.

TO 411—ELECTRICAL MACHINERY—3 cr. (3 and 0)
Coverage includes the theory of operation and application of D-C and A-C machines and transformers. External characteristics are depicted from the machine equivalent circuit. *Prerequisite:* TO 312.

TO 412—ELEMENTS OF ELECTRONICS—3 cr. (3 and 0)
Theory and operation of electronic circuits and control with emphasis on equipment for industrial application. *Prerequisite:* TO 311.

TO 415—INSTRUMENTATION—3 cr. (3 and 0)
A study of measurements and a survey of instruments and devices for measuring quantities found in industrial applications. Analog and digital output forms of data and conversion of analog-to-digital is included. *Prerequisite:* TO 311, TO 412.

TO 421—HEATING AND AIR CONDITIONING—3 cr. (3 and 0)
Psychrometric properties and processes; heating and cooling load calculations; selection and layout of major equipment for heating systems and air conditioning systems, refrigeration and automatic controls. *Prerequisite:* TO 322.

TO 431—ELECTRICAL LABORATORY—1 cr. (0 and 3)
A laboratory course designed to complement instruction in TO 311, TO 312, and TO 411. *Prerequisite:* TO 311, TO 312, and concurrent registration in TO 411.

TEXTILE CHEMISTRY

Professors: T. A. CAMPBELL, JR., *Head;* T. D. EFLAND, F. T. SIMON

Associate Professors: R. H. BARKER, J. L. LUNDBERG, D. W. LYONS, E. S. OLSON, J. J. PORTER

Instructor: C. G. VAUGHN

TC 303—TEXTILE CHEMISTRY—3 cr. (3 and 0)
Fundamental principles of physical and organic chemistry with emphasis on those areas most frequently encountered in the textile industry including thermodynamics, kinetics, and solution properties. These concepts will be applied to the study of aliphatic organic compounds and organic reaction mechanisms. The basic principles of stereochemistry and conformational analysis will be developed. *Prerequisite:* Ch 102, Math 206.

TC 304—TEXTILE CHEMISTRY—3 cr. (3 and 0)
A study of the properties and reactions of aliphatic and aromatic organic compounds. Emphasis will be placed on mechanistic interpretations and the development of synthetic schemes leading to polyfunctional compounds of the types encountered in the textile industry. *Prerequisite:* TC 303.

TC 305—Textile Chemistry Laboratory—1 cr. (0 and 3)
An introduction to the techniques used in the synthesis of organic compounds and the measurement of their physico-chemical properties. To be taken concurrently with TC 303.

TC 306—Textile Chemistry Laboratory—1 cr. (0 and 3)
The techniques used in the synthesis and characterization of organic compounds. To be taken concurrently with TC 304.

TC 315—Introduction to Polymer Science and Engineering—3 cr. (3 and 0)
The chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Kinetics of polymerization, molecular characterization, structure, morphology, and mechanical properties of polymers are studied demonstrating design of polymer systems for end use in textiles.

TC 316—Chemical Preparation of Textiles—3 cr. (2 and 3)
The chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers. Colloidal and surface active properties of various compounds and the fundamental factors influencing these properties. *Prerequisite:* TC 315.

TC 317—Polymer and Fiber Laboratory—1 cr. (0 and 3)
High polymers, prepared from monomers, are characterized and spun to make fibers. Chemical and physical properties of fiber forming polymers are measured as functions of parameters critical to properties of textiles.

TC 457—Dyeing and Finishing I—3 cr. (3 and 0)
A study of the different classes of dyestuffs and the chemistry of their applications to different fibers. The theories, principles and mechanisms for the dyeing of textile fibers and fabrics will be presented as well as the reaction mechanisms of various finishing agents applied to different substrates. *Prerequisite:* TC 315.

TC 458—Dyeing and Finishing II—3 cr. (3 and 0)
The kinetics and equilibria of dyeing processes. The use of conductivity, diffusion and other methods useful for measuring absorption isotherms and dyeing rates and the general thermodynamic relationships applicable to dyeing operations. Fiber properties such as zeta potential dye sites, relative amorphous area available will be included.

TC 459—Dyeing and Finishing Laboratory I—1 cr. (0 and 3)
To be scheduled concurrently with TC 457. The course will introduce the student to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations.

TC 460—Dyeing and Finishing Laboratory II—1 cr. (0 and 3)
To be scheduled concurrently with TC 458. The course will cover finishing in addition to dyeing operations and their instrumental control.

TC 461—Seminar and Research—3 cr. (1 and 6)
An investigation by each textile chemistry senior of an assigned problem related to textile processing. A formal written report is required. *Prerequisite:* Senior standing.

TC 466—Textile Unit Operations—3 cr. (3 and 0)
Designed to cover some of the principles behind textile equipment operation such as heat transfer in drying and dyeing processes and fluid flow in pressure and open dye operations and polymer production.

TC 475—Cellulose Chemistry—2 cr. (2 and 0)
The organic chemistry of cellulose and its derivatives is developed from the basic principles of carbohydrate chemistry. Emphasis is placed in the substitution and degradation reactions which are of particular importance in textile applications. Fiber morphology is treated in relation to its effect on textile chemical processing. *Prerequisite:* TC 315 or permission of instructor.

TC 615—Introduction to Polymer Science and Engineering—3 cr. (3 and 0)

TC 616—Chemical Preparation of Textiles—3 cr. (2 and 3)

TC 617—Polymer and Fiber Laboratory—1 cr. (0 and 3)

TC 757—Dyeing and Finishing I—3 cr. (3 and 0)

TC 758—Dyeing and Finishing II—3 cr. (3 and 0)

TC 759—Dyeing and Finishing Laboratory I—1 cr. (0 and 3)

TC 766—Textile Unit Operations—3 cr. (3 and 0)

TC 775—Cellulose Chemistry—2 cr. (2 and 0)

TC 811—The Theory of Fiber-Forming High Polymers I—3 cr. (3 and 0)

TC 812—The Theory of Fiber-Forming High Polymers II—3 cr. (3 and 0)

TC 821—Advanced Cellulose Chemistry—3 cr. (3 and 0)

TC 831—The Physical Chemistry of Dyeing—3 cr. (3 and 0)

TC 891—Research—Credit to be arranged.

TEXTILE SCIENCE

Professors: T. A. Campbell, Jr., *Head;* T. D. Efland, F. T. Simon, J. V. Walters

Associate Professors: J. C. Hubbard, Jr., J. L. Lundberg, D. W. Lyons, J. H. Marvin, Jr., D. P. Thomson, Jr.

Assistant Professor: E. A. Vaughn

Instructor: C. G. Vaughan

Visiting Lecturer: H. M. El Behery

Text 122—Introduction to Textiles—1 cr. (1 and 0)
An introduction to the various areas involved in the scientific processing of fibrous materials, and the production of yarns and fabrics. The finishing, fabrication and market potential textile materials.

Text 201—Fiber Processing I—3 cr. (2 and 3)
A study of fibrous materials and their relationship to the fiber processing systems. The objectives, theories, principles, and mechanisms of the machines used in the earlier stages of fiber processing. The course is directed primarily to the staple fiber processing systems. Mechanical and mathmetical fundamentals are applied to the machines concerned.

Text 202—Fiber Processing II—3 cr. (2 and 3)

Continuation of Text 201 emphasizing the later stages of fiber processing for the ultimate yarn strand. *Prerequisite:* Text 201.

Text 303—Fiber Processing III—3 cr. (2 and 3)

The concepts of current fiber processing machines, techniques, practices, and their validity are investigated. Student group and individual problems are assigned that require use of acquired knowledge, textile testing equipment, and processing machines. Study and examination of the cause and effect relations of fibrous material properties and processing dynamics on the fiber assemblies produced. *Prerequisite:* Text 201 and 202.

Text 304—Fiber Processing IV—3 cr. (2 and 3)

Continuation of Text 303 with respect to the various fiber assemblies and yarn structures encountered in the fiber processing systems. Emphasis is placed on the machines and their fiber assemblies. *Prerequisite:* Text 201, 202, and 303.

Text 305—Yarn Structure I—3 cr. (2 and 3)

Basic study of materials used for manufacturing yarns. Machine mechanisms, theory and operations for the opening, picking, carding, and combing of fibers. Draft, production, and waste at these machines are analyzed. Other factors concerned with this portion of a textile plant covered generally, including organization and layout. *Prerequisite:* Junior standing. Non-textile majors.

Text 306—Yarn Structure II—3 cr. (2 and 3)

Machine mechanisms, theory, and operations for the drawing, roving, spinning, and twister frames. Emphasis is on the drafting, twisting, and winding components for these processes. Brief survey of the silk, and worsted system for yarn production. *Prerequisite:* Text 305. Non-textile majors.

Text 311—Fabric Development I—3 cr. (2 and 3)

The theory of mechanisms as applied to weaving machines together with the application of the theory of elementary textile designs used in the construction of woven fabrics.

Text 312—Fabric Development II—3 cr. (2 and 3)

A continuation of Text 311 with emphasis on special and compound materials fabrication. *Prerequisite:* Text 311.

Text 313—Fabric Structure I—3 cr. (2 and 3)

Theory and practice involved in the application of design to textile end uses. Principles involved in converting yarns to fabrics, including loom mechanics. *Prerequisite:* Junior standing. Non-textile majors.

Text 314—Fabric Structure II—3 cr. (2 and 3)

Continuation of Text 313, emphasizing fabric layout and analysis, cover factor, production analysis and scheduling. *Prerequisite:* Text 313.

Text 321—Fiber Science—3 cr. (2 and 3)

Fiber properties and the methods for scientific evaluation of these properties. *Prerequisite:* Math 206.

Text 322—Properties of Textile Structures—3 cr. (2 and 3)

The analysis and significance of yarn and fabric properties and a study of methods of determining these properties.

Text 324—Textile Statistics—3 cr. (3 and 0)
An introduction to statistics with particular application to the Textile Industry. Measures of central value and variation, probability, the normal curve, tests of hypotheses, elementary correlation and regression. *Prerequisite:* Junior standing.

Text 401—Polymer and Fiber Mechanics—3 cr. (3 and 0)
Study of elasticity theory and viscoelasticity applied to polymers and extended to non-linear behavior of fibers and non-linear rheological behavior of polymers with application to extrusion and fiber spinning.

Text 411—Fabric Development III—3 cr. (2 and 3)
The principles concerning the specifications required for the production of fabrics to include layouts, designs, construction, warping, and slashing. *Prerequisite:* Text 312.

Text 412—Fabric Development IV—3 cr. (2 and 3)
Production and analysis of woven patterns. Fabric development, analysis and cloth order problems. *Prerequisite:* Text 411.

Text 413—Fabric Development V—3 cr. (2 and 3)
A continuation of Text 412 covering more complex weaves for double cloths, pile fabrics, and jacquard effects. *Prerequisite:* Concurrent with Text 412.

Text 414—Non-woven and Knitted Structures—3 cr. (3 and 0)
A survey of non-woven and knitted structures dealing with the principles and mechanisms involved. Various systems are covered with emphasis on yarn requirements and fabric properties.

Text 421—Textile Costing I—3 cr. (2 and 3)
Actual and standard cost principles as they apply to the manufacture of textiles. Allocating the cost of material, labor and overhead; determining the cost of individual yarns and fabrics; valuing the inventory; making of cost reports, payroll analysis and the use of data processing. *Prerequisite:* Acct 201 and Senior standing or permission of instructor.

Text 426—Instrumentation—3 cr. (3 and 0)
The principles of industrial and process instrumentation and process control. Static and dynamic characteristics of measurement devices. Transducer techniques for measurement of physical properties such as pressure, temperature, flow, weight, etc. Principles of process controllers.

Text 428—Textile Research—0 to 3 cr.
The student will conduct an individual research problem in the textile or textile chemistry area under the direct supervision and guidance of a faculty member.

Text 429—Textile Research—0 to 3 cr.
Same as Text 428.

Text 440—Color Science—3 cr. (2 and 3)
The application of the science of color to industrial practice in textiles, plastics, paints, lighting and ceramics. The laboratory work will be performed on modern instruments and computers.

Text 460—Textile Processes—3 cr. (3 and 0)
Survey of machinery and processes of textile manufacturing from fiber formation through fabric finishing. (For students with a non-textile background.)

TEXT 475—TEXTILE MARKETING—3 cr. (3 and 0)
An examination of the activities involved in the distribution of textile products in today's market. Emphasis will be placed on the role of consumer research and the analysis of fashion in the design and promotion of textile products.

TEXT 603—FIBER PROCESSING III—3 cr. (2 and 3)

TEXT 604—FIBER PROCESSING IV—3 cr. (2 and 3)

TEXT 621—FIBER SCIENCE—3 cr. (2 and 3)

TEXT 622—PROPERTIES OF TEXTILE STRUCTURES—3 cr. (2 and 3)

TEXT 701—POLYMER AND FIBER MECHANICS—3 cr. (3 and 0)

TEXT 711—FABRIC DEVELOPMENT III—3 cr. (2 and 3)

TEXT 712—FABRIC DEVELOPMENT IV—3 cr. (2 and 3)

TEXT 726—INSTRUMENTATION—3 cr. (3 and 0)

TEXT 740—COLOR SCIENCE—3 cr. (2 and 3)

TEXT 760—TEXTILE PROCESSES—3 cr. (3 and 0)

TEXT 821—FIBER PHYSICS I—3 cr. (3 and 0)

TEXT 822—FIBER PHYSICS II—3 cr. (3 and 0)

TEXT 830—TEXTILE PHYSICS—3 cr. (3 and 0)

TEXT 840—SPECTROPHOTOMETRY—3 cr. (3 and 0)

TEXT 870—ADVANCES IN TEXTILE MANUFACTURING—3 cr. (3 and 0)

TEXT 880—SELECTED TOPICS—3 cr. (3 and 0)

TEXT 891—RESEARCH—Credit to be arranged.

VISUAL STUDIES

Professor: R. H. HUNTER, *Head*
Associate Professors: J. T. ACORN,[*] I. G. REGNIER
Assistant Professors: S. WANG, D. WADDELL

VIS 203—VISUAL ARTS STUDIO—2 cr. (0 and 6)
Studio work in drawing, painting, and related media. *Prerequisite:* Arch 403 or permission of the instructor.

VIS 205—DRAWING—2 cr. (0 and 6)
Studio work in drawing and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

VIS 207—BEGINNING PAINTING—2 cr. (0 and 6)
Studio work in painting and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of the instructor.

VIS 209—BEGINNING SCULPTURE—2 cr. (0 and 6)
Studio work in sculpture and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

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[*] On leave.

Vis 211—Beginning Printmaking—2 cr. (0 and 6)

Studio work in lithography, silk screen, wood cuts, and graphics and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

Vis 213—Beginning Photography—2 cr. (0 and 6)

Studio work in photography and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

Vis 215—Beginning Graphics—2 cr. (0 and 6)

Studio work in graphic composition, letterpress, photo lithography, silk screen process and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

Vis 305—Life Drawing—2 cr. (0 and 6)

Studio work in life drawing and related subject matter. *Prerequisite:* Vis 205, or Vis 207, or Vis 209.

Vis 306—Life Drawing—2 cr. (0 and 6)

Continuation of Vis 305. *Prerequisite:* Vis 305.

Vis 307—Painting—2 cr. (0 and 6)

Studio work in water color and related media. *Prerequisite:* Vis 207.

Vis 308—Painting—2 cr. (0 and 6)

Continuation of Vis 307. *Prerequisite:* Vis 307.

Vis 309—Sculpture—2 cr. (0 and 6)

Studio work in sculpture and related media. *Prerequisite:* Vis 209.

Vis 310—Sculpture—2 cr. (0 and 6)

Continuation of Vis 309. *Prerequisite:* Vis 309.

Vis 311—Printmaking—2 cr. (0 and 6)

Studio work in lithography, silk screen, etching, wood cuts and related media. *Prerequisite:* Vis 211.

Vis 312—Printmaking—2 cr. (0 and 6)

Continuation of Vis 311. *Prerequisite:* Vis 311.

Vis 313—Photography—2 cr. (0 and 6)

Studio work in still photography and related media. *Prerequisite:* Vis 213.

Vis 314—Photography—2 cr. (0 and 6)

Continuation of Vis 313. *Prerequisite:* Vis 313.

Vis 315—Graphics—2 cr. (0 and 6)

Studio work in graphic composition, letterpress, photo lithography, silk screen process, and related media. *Prerequisite:* Vis 215.

Vis 316—Graphics—2 cr. (0 and 6)

Continuation of Vis 316. *Prerequisite:* Vis 316.

Vis 317—Beginning Ceramic Arts—2 cr. (0 and 6)

Applied studio work in ceramic sculpture and pottery; creative experience in process of forming, decorating, glazing, and firing. *Prerequisite:* Cr Ar 101.

Vis 318—Ceramic Arts—2 cr. (0 and 6)

Continuation of Vis 317. *Prerequisite:* Vis 317.

Vis 405—Drawing—3 cr. (0 and 9)
Studio work in advanced drawing and related media. *Prerequisite:* Vis 306 or Vis 308 or Vis 312 or Vis 316.

Vis 406—Drawing—3 cr. (0 and 9)
Continuation of Vis 405. *Prerequisite:* Vis 405.

Vis 407—Painting—3 cr. (0 and 9)
Studio work in advanced painting and related media. *Prerequisite:* Vis 308 or Vis 312 or Vis 314, Vis 316.

Vis 408—Painting—3 cr. (0 and 9)
Continuation of Vis 407. *Prerequisite:* Vis 407.

Vis 409—Sculpture—3 cr. (0 and 9)
Advanced studio work in sculpture and related media. *Prerequisite:* Vis 310.

Vis 410—Sculpture—3 cr. (0 and 9)
Continuation of Vis 409. *Prerequisite:* Vis 409.

Vis 411—Printmaking—3 cr. (0 and 9)
Advanced studio in Printmaking and related media. *Prerequisite:* Vis 312.

Vis 412—Printmaking—3 cr. (0 and 9)
Continuation of Vis 411. *Prerequisite:* Vis 411.

Vis 413—Photography—3 cr. (0 and 9)
Advanced studio work in photography. *Prerequisite:* Vis 314.

Vis 414—Photography—3 cr. (0 and 9)
Continuation of Vis 413. *Prerequisite:* Vis 413.

Vis 415—Graphics—3 cr. (0 and 9)
Advanced work in graphic arts. *Prerequisite:* Vis 316.

Vis 416—Graphics—3 cr. (0 and 9)
Continuation of Vis 415. *Prerequisite:* Vis 415.

Vis 417—Advanced Ceramic Arts—3 cr. (0 and 9)
Advanced applied studio work in ceramic sculpture and pottery. *Prerequisite:* Vis 318.

Vis 418—Advanced Ceramic Arts—3 cr. (0 and 9)
Continuation of Vis 417. *Prerequisite:* Vis 417.

Vis 503—Contemporary Art Criticism—3 cr. (3 and 0)
A seminar course dealing with Twentieth Century visual art forms in relation to the factors that have influenced the artist and the consequence of his production on society. *Prerequisite:* Vis 305 or 307 or 309 or 311 or 313 and Arch 415.

WATER RESOURCES ENGINEERING

Professor: L. G. Rich, *Program Director*

WRE 811—Climatology—3 cr. (3 and 0)

WRE 812—Meteorology—3 cr. (3 and 0)

WRE 822—Water Movement in Soils—3 cr. (3 and 0)

WRE 861—Hydrology—3 cr. (3 and 0)

WRE 862—Advanced Hydrology—3 cr. (3 and 0)

WRE 864—Ground-Water Hydrology—3 cr. (3 and 0)

WRE 865—Hydrology I—3 cr. (3 and 0)

WRE 866—Hydrology II—3 cr. (3 and 0)

WRE 875—River Basin Planning—3 cr. (3 and 0)

WRE 881—Special Topics in Water Resources—3 cr. (3 and 0)

WRE 891—Research—Credit to be arranged.

WRE 981—Special Topics in Water Resources—3 cr. (3 and 0)

WRE 982—Special Topics in Water Resources—3 cr. (3 and 0)

WRE 991—Doctoral Research—Credit to be arranged.

WILDLIFE BIOLOGY

Associate Professors: S. B. Hays, R. E. Ware, L. G. Webb

WB 306—Wildlife Resources of the Southeastern United States—2 cr. (2 and 0) F, S
A study of the wildlife resources of the Southeastern States, including population trends, life histories and economic importance. Conservation and proper utilization by man is emphasized.

WB 412—Wildlife Management—3 cr. (2 and 3) F, S
Basic principles and general practices of wildlife management and conservation will be covered. This course deals with the major problems concerning the management of wildlife resources, with emphasis on upland game species. The laboratory work includes practical work on the Clemson University Woodlands and field trips to several areas where wildlife management is being practiced.

WB 712—Wildlife Management—3 cr. (2 and 3)

WB 809—Wildlife Biology Seminar I—1 cr. (1 and 0)

WB 810—Wildlife Biology Seminar II—1 cr. (1 and 0)

WB 815—Principles of Wildlife Biology—3 cr. (2 and 3)

WB 816—Applied Wildlife Biology—3 cr. (2 and 3)

WB 891—Research—1-6 cr.

ZOOLOGY

(See also Biology)

Professors: E. W. King, J. K. Reed

Associate Professors: G. W. Anderson, A. S. Tombes, *Chairman;* R. E. Ware

Assistant Professors: W. E. Bachop, E. D. Brodie, Ruth L. Hays, R. T. Sawyer, W. K. Willard

Instructor: J. M. Barrier

Zool 101, 103—General Zoology—4 cr. (3 and 2) F, S, SS

Thorough training in fundamental animal types and zoological principles. The morphology, physiology, behavior, reproduction, ecology, embryology, zoogeography, evolution and palaeontology of each phylum are presented.

Zool 201—Invertebrate Zoology—4 cr. (3 and 3) F, S

A survey of the phyla of invertebrate animals, including their taxonomy, morphology, development and evolution. *Prerequisite:* Zool 101, 103 or permission of instructor.

Zool 202—Vertebrate Zoology—4 cr. (3 and 3)

A study of vertebrates with an emphasis on systematic relationships and evolutionary advances. Laboratory will be concerned with basic morphological traits of each group as well as the ecology, life history, and identification of local forms. *Prerequisite:* Zool 101, 103,

Zool 301—Comparative Vertebrate Anatomy—3 cr. (2 and 3) F, S, SS

Advanced training in zoological principles, physiology and comparative vertebrate anatomy. *Prerequisite:* Zool 101, 103.

Zool 302—Vertebrate Embryology—3 cr. (2 and 3) F, S, SS

Fundamentals of developmental anatomy of the organ systems as illustrated by the chick and pig. Students prepare histological sections and mounts to acquire practice in laboratory procedures and knowledge of vertebrate microscopic anatomy. Identification of the various tissues is stressed. *Prerequisite:* Zool 101, 103 and 301 or permission of the instructor.

Zool H302—Vetebrate Embryology—3 cr. (2 and 3) F, S, SS

Honors option for Zool 302, admission by special arrangement.

Zool 304—Animal Ecology—3 cr. (2 and 3) F

Marine, fresh water and land animal communities as they exist in South Carolina. Students will gain a knowledge of the common animal associations as they are related to land use through lectures, reading, films and field trips.

Zool H304—Animal Ecology—3 cr. (2 and 3) F

Honors option for Zool 304, admission by special arrangement.

Zool 307—Animal Anatomy and Physiology—3 cr. (2 and 3) F

Anatomy, and physiological processes of ingestion, secretion, excretion, respiration, circulation, reproduction and metabolism of warm-blooded animals. This course is designed for students majoring in Pre-medicine, Pre-veterinary, Animal Science, Dairy Science, and Poultry Science. *Prerequisite:* Zool 101, 103.

Zool 403—Protozoology—3 cr. (2 and 3) S

Taxonomy of the sub-kingdom protozoa with special reference to the parasitic forms directly affecting man. Representative types of free-living forms are surveyed with emphasis on their morphology, physiology and distribution. *Prerequisite:* Zool 101, 103.

Zool H403—Protozoology—3 cr. (2 and 3) S
Honors option for Zool 403, admission by special arrangement.

Zool 404—Animal Pathology—3 cr. (2 and 3) S
Designed to inform students in the causes, treatments, and prevention of animal diseases. Those transmissible to man are considered in detail. Emphasis is placed on hygiene and care of the sick.

Zool 405—Animal Histology—3 cr. (2 and 3) F
Microscopic structures of tissues and organs of the animal body. This course is for students in Pre-veterinary, Pre-medicine and the Animal Science courses. *Prerequisite:* Zool 101, 103.

Zool 410—Limnology—3 cr. (2 and 3) F
This course is designed to familiarize the student with interrelationships between fresh-water organisms and their abiotic environment. *Prerequisite:* Zool 101, 103.

Zool H410—Limnology—3 cr. (2 and 3) F
Honors option for Zool 410, admission by special arrangement.

Zool 411—Animal Ecology—3 cr. (2 and 3)
A fundamental approach to basic ecological principles underlying the interrelationships of organisms with their abiotic environment. A variety of equatic and terrestrial ecosystems will be studied both in the field and in the laboratory.

Zool H411—Animal Ecology—3 cr. (2 and 3)
Honors option for Zool 411, admission by special arrangement.

Zool 456—Parasitology—3 cr. (2 and 3) F
An introduction to the phenomenon of parasitism in the animal kingdom with emphasis on basic principles. Classical and experimental approaches to the study of parasitism are examined in reference to the protozoa, helminths and arthropods.

Zool H456—Parasitology—3 cr. (2 and 3) F
Honors option for Zool 456, admission by special arrangement.

Zool 458—Cell Physiology—3 cr. (2 and 3) F
An introduction to the fundamental processes of physiology as exemplified by the cell. Dynamic cellular environment, organelles, respiration, metabolism, protein synthesis, and basic thermodynamics as it applies to the cell, will be covered. Laboratory will include an introduction to techniques in study of cellular physiology. *Prerequisite:* Zool 101, 103, Organic Chemistry.

Zool H458—Cell Physiology—3 cr. (2 and 3) F
Honors option for Zool 458, admission by special arrangement.

Zool 460—General Physiology—3 cr. (2 and 3) S
Systematic study of the physiology of nervous activity, hormonal control, neuro-hormonal interrelations, circulation, respiration, digestion, renal control, muscular activity and reproduction. Effort in the laboratory will be concentrated toward acquainting the student with methods of obtaining information about these systems. *Prerequisite:* Zool 101, 103 or permission of instructor.

Zool 461—Anatomy—3 cr. (3 and 0) F
Those aspects of anatomy related to the skeletal, circulatory, muscular, nervous, endocrine, respiratory, digestive and excretory systems will be covered. Emphasis will be placed on gross anatomy with some work in micro-anatomy. *Prerequisite:* Zool 101, 103 or permission of instructor.

Zool 462—Herpetology—3 cr. (2 and 3)
Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families and U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology or approval of instructor.

Zool 463—Ichthyology—3 cr. (2 and 3)
Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology or approval of instructor.

Zool 464—Mammalogy—3 cr. (2 and 3)
Systematics, life history, distribution, ecology, and current literature of mammals. Laboratory study of morphology and identification of U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology of approval of instructor.

Zool 465—Ornithology—3 cr. (2 and 3)
The identification, life history and ecology of birds. Field trips, work with bird specimens and correlated reading will give the student a working knowledge of at least 100 species of the common birds.

Zool 470—Animal Ethology—3 cr. (2 and 3)
Classical and current concepts and controversies regarding animal behavior; individual and social behavioral patterns. *Prerequisite:* Vertebrate Zoology or consent of instructor.

Zool 475—General Endocrinology—3 cr. (2 and 3)
This course is an introduction to the basic principles of chemical integration via hormones found throughout the animal kingdom. Morphology and function of various endocrine tissues, hormone chemistry and modes of action will receive major consideration.

Zool 602—Vertebrate Embryology—3 cr. (2 and 3)

Zool 604—Animal Ecology—3 cr. (2 and 3)

Zool 703—Protozoology—3 cr. (2 and 3)

Zool 704—Animal Pathology—3 cr. (2 and 3)

Zool 705—Animal Histology—3 cr. (2 and 3)

Zool 710—Limnology—3 cr. (2 and 3)

Zool 711—Animal Ecology—3 cr. (2 and 3)

Zool 756—Parasitology—3 cr. (2 and 3)

Zool 758—Cell Physiology—3 cr. (2 and 3)

Zool 760—General Physiology—3 cr. (2 and 3)

Zool 761—Anatomy—3 cr. (3 and 0)

ZOOL 762—HERPETOLOGY—3 cr. (2 and 3)

ZOOL 763—ICHTHYOLOGY—3 cr. (2 and 3)

ZOOL 764—MAMMALOGY—3 cr. (2 and 3)

ZOOL 765—ORNITHOLOGY—3 cr. (2 and 3)

ZOOL 770—ANIMAL ETHOLOGY—3 cr. (2 and 3)

ZOOL 775—GENERAL ENDOCRINOLOGY—3 cr. (3 and 0)

ZOOL 801—ANIMAL HISTOLOGY—3 cr. (2 and 3)

ZOOL 802—HISTOLOGICAL TECHNIQUES—3 cr. (1 and 6)

ZOOL 803—POPULATION DYNAMICS—4 cr. (2 and 6)

ZOOL 804—ORNITHOLOGY—3 cr. (2 and 3)

ZOOL 805—ANIMAL PATHOLOGY—3 cr. (3 and 0)

ZOOL 806—COMPARATIVE ANIMAL PHYSIOLOGY—3 cr. (3 and 0)

ZOOL 807—USE OF RADIOISOTOPES IN BIOLOGICAL RESEARCH—3 cr. (2 and 3)

ZOOL 808—RADIOBIOLOGY—3 cr. (2 and 3)

ZOOL 809—TOXICOLOGY—3 cr. (2 and 3)

ZOOL 810—MAMMALOGY—3 cr. (2 and 3)

ZOOL 811—RECENT ADVANCES IN ZOOLOGY I—1 cr. (1 and 0)

ZOOL 812—RECENT ADVANCES IN ZOOLOGY II—1 cr. (1 and 0)

ZOOL 813—EVOLUTION—3 cr. (3 and 0)

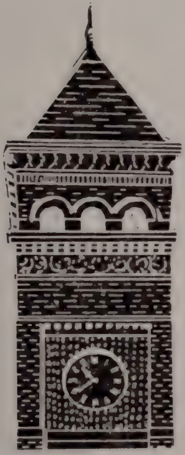
ZOOL 852—PRINCIPLES AND METHDDS OF SYSTEMATIC ZOOLOGY—2 cr. (2 and 0)

ZOOL 856—ECONOMIC ZOOLOGY—3 cr. (2 and 3)

ZOOL 863—SPECIAL PROBLEMS—1 to 4 cr.

ZOOL 891—RESEARCH—Credit to be arranged.

ZOOL 991—RESEARCH—Credit to be arranged.



PUBLIC SERVICE ACTIVITIES

PART VI

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES STAFF

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Curtys Ballentine, M.S.	Associate District Agent, Piedmont District, Clemson
Elizabeth B. Berry, B.S.	Associate District Agent, Savannah Valley District, Clemson
Sarah S. Knox, B.S.	Associate District Agent, Pee Dee District, Clemson

Superintendents Branch Experiment Stations

W. C. Barnes, Ph.D.—	Truck Station, P. O. Box 3158, St. Andrews Branch, Charleston
D. F. Cohoon, Ph.D.	P. O. Box C, Edisto Station, Blackville
J. B. Pitner, Ph.D.	P. O. Box 271, Pee Dee Station, Florence
W. H. Rhodes, B.S.	Sandhill Station, P. O. Box 1771, Columbia

Agricultural Chemical Services

N. R. Page, Ph.D.*†	Head of Department, Professor
J. S. Boswell, B.A.†	Chemist Assistant
Dorothy Brock †	Assistant Chemist

---

* Teaching staff.
† Research staff.

D. A. Colby, B.A.†	Chemist Assistant
E. R. Colcolough, B.S.†	Chemistry Assistant
J. T. Gillingham, Ph.D.†	Assistant Chemist
H. Jurecek, B.S.†	Chemistry Assistant
E. E. Leslie, B.S.†	Associate Chemist
W. R. McCaskill, M.S.†	Assistant Entomologist
Mary Lee McCrackan, A.B.†	Assistant Chemist
J. J. Starnes, B.S.†	Chemistry Assistant

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C. H. Whitworth, B.S.A.†	Agricultural Statistician, Columbia (USDA)
P. S. Williamon, M.S.‡	Associate Extension Specialist

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* Teaching staff.
† Research staff.
‡ Extension staff.
§ On leave.

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Agricultural Engineering

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J. C. Alphin, Ph.D.†	Associate Professor, Pee Dee Station
W. A. Balk, B.S.†	Associate Agricultural Engineer, Edisto Station
J. B. Cocke, B.S.†	Agricultural Engineer (USDA)
J. T. Craig, M.S.*	Assistant Professor
D. G. Dickson, M.S.†	Research Assistant
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C. D. Veal, M.S.†	Research Assistant
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G. R. Craddock, Ph.D.*†	Professor
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Z. T. Ford, B.S.†	Associate Agronomist, Pee Dee Station (USDA)
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Alfred Manwiller, Ph.D.†	Associate Professor, Pee Dee Station
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B. C. Morton, M.S.†	Agricultural Science Assistant
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C. L. Parks, Ph.D.‡	Associate Extension Specialist

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* Teaching staff.
† Research staff.
‡ Extension staff.

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W. H. Rhodes, B.S.[†]	Superintendent, Sandhill Station
C. E. Rieck, Ph.D.[*,†]	Assistant Professor
R. F. Suman, M.S.[†]	Associate Professor, Edisto Station
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L. F. Cato, M.S.[‡]	Associate Extension Specialist
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D. R. Lamond, Ph.D., D.V.Sc.[*,†]	Visiting Professor
S. L. Moore, D.V.M.[†,¶]	Assistant State Veterinarian
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G. C. Skelley, Jr., Ph.D.[*,†]	Associate Professor
J. N. Williams II, Ph.D.[‡]	Principal Extension Specialist
J. F. Wise, M.S.[‡]	Associate Extension Specialist
S. G. Woods, B.S.[†]	Assistant Professor, Edisto Station

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F. E. Pardue, M.S.[‡]	Associate Extension Specialist
C. B. Reeves, M.S.[‡]	Associate Extension Specialist

Entomology and Economic Zoology

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J. V. Bell, M.S.[†]	Microbiologist, Truck Station (USDA)
C. S. Creighton, B.S.[†]	Research Entomologist, Truck Station (USDA)
F. P. Cuthbert, Jr., B.S.[†]	Research Entomologist, Truck Station (USDA)
Augustine Day, B.S.[†]	Entomologist, Truck Station (USDA)
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J. B. Kissam, Ph.D.[‡]	Associate Extension Specialist—Entomology

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[*] Teaching staff.
[†] Research staff.
[‡] Extension staff.
[¶] Part time.

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J. K. Reed, Ph.D.*	Professor
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T. E. Skelton, Ph.D.*†	Assistant Professor
L. M. Sparks, Jr., M.S.‡	Associate Extension Specialist—Entomology
H. M. Taft, Ph.D.†	Leader, Cotton Insects Investigations, Pee Dee Station (USDA)
C. A. Thomas, Jr., Ph.D.‡	Associate Extension Specialist—Entomology
S. G. Turnipseed, Ph.D.†	Associate Professor, Edisto Station
L. G. Webb, Ph.D.*†¶	Associate Professor Leader, Clemson Wildlife Research Project

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C. B. Loadholt, M.S.*†	Assistant Professor

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J. J. Jen, Ph.D.*†	Assistant Professor
J. H. Mitchell, Jr., Ph.D.*†	Professor
L. E. Vereen, Ph.D.*†	Assistant Professor

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R. E. Schoenike, Ph.D.*†	Associate Professor
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A. T. Shearin, B.S.†	Baruch Resident Research Forest Manager
J. R. Warner, D.F.*†	Professor
T. E. Wooten, Ph.D.*†	Assistant Professor

Four-H Club Work

G. H. Baker, B.S.‡	State Leader, 4-H Programs
J. B. Williams, B.S.‡	Extension Specialist (4-H Club Work) Principal Specialist
E. Joyce Richardson, M.S.‡	Assistant Extension Specialist (4-H Club Work)
Georgia T. Roberson, M.Ed.‡	Associate Extension Specialist (4-H Club Work)
J. T. Rogers, B.S.‡	Associate Extension Specialist (4-H Club Work)

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* Teaching staff.
† Research staff.
‡ Extension staff.
¶ Part time.

Home Economics

Veronica D. Carmack, M.S.	Assistant Extension Specialist (Home Management)
Marie S. Hindman, M.S.‡	Extension Specialist (Nutrition)
Frances H. Odom, M.A.‡	Extension Specialist (Housing)
Julia B. Taylor, M.S.‡	Extension Specialist (Home Furnishings)
W. L. Yates, M.S.‡	Assistant Extension Specialist (Family Life)

Horticulture

T. L. Senn, Ph.D.*†‡	Head of Department, Professor
W. C. Barnes, Ph.D.†	Superintendent and Professor, Truck Station
R. A. Baumgardner, Ph.D.‡	Associate Extension Specialist
Guy L. Buckner†	Horticultural Assistant, Truck Station
W. P. Cook, M.S.‡	Assistant Extension Specialist
J. H. Crawford, M.S.†	Assistant Professor
D. O. Ezell, Ph.D.‡	Assistant Extension Specialist
R. J. Ferree, M.S.‡	Extension Specialist, Principal Specialist
J. P. Fulmer, M.S.*†	Assistant Professor
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M. G. Hamilton, Ph.D.†	Associate Professor, Edisto Station
M. B. Hughes, Ph.D.†	Professor, Edisto Station
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G. E. Stembridge, Ph.D.*†	Associate Professor
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L. O. Van Blaricom, M.S., Ch.E.*†	Professor

Plant Pathology and Physiology

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L. W. Baxter, Ph.D.*†	Associate Professor
C. W. Blackmon, Ph.D.†	Assistant Professor, Edisto Station
N. D. Camper, Ph.D.*†	Assistant Professor
D. F. Cohoon, Ph.D.*†	Superintendent and Professor, Edisto Station
W. M. Dowler, Ph.D.*†‡	Lecturer, Plant Pathologist (USDA)
T. W. Graham, Ph.D.†	Plant Pathologist, Pee Dee Station (USDA)
J. E. Halpin, Ph.D†	Professor
G. C. Kingsland, Ph.D.*†	Associate Professor
W. C. Nettles, M.S.‡	Principal Extension Specialist—Entomology and Plant Pathology
W. R. Sitterly, Ph.D.†	Professor, Truck Station
F. H. Smith, M.S.‡	Associate Extension Specialist—Plant Pathology
Wesley Witcher, Ph.D*†	Associate Professor
E. I. Zehr, Ph.D.*†	Assistant Professor

Plant Pest Regulatory Service

L. H. Senn, Ph.D.†	State Entomologist
W. M. Epps, Ph.D.*†	State Plant Pathologist
R. C. Fox, Ph.D.*†	Professor
D. M. Gaydon, M.S.†	Assistant Entomologist
F. J. Howard, Jr., M.S.†	Research Assistant
V. H. McCaskill, M.S.†	Assistant Entomologist
L. R. Morgan, B.S.†	Entomology Assistant

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* Teaching staff.
† Research staff.
‡ Extension staff.

D. C. Weeks, M.S.[†]	Assistant Entomologist
Wesley Witcher, Ph.D.[*][†]	Associate Professor

Poultry Science

B. D. Barnett, Ph.D.[*][†][‡]	Head of Department, Professor
B. W. Bierer, V.M.D.[†]	Professor, Laboratory Director, Columbia
M. A. Boone, Ph.D.[†]	Professor
J. B. Cooper, M.S.[*][†]	Associate Professor
J. E. Jones, Ph.D.[*][†]	Assistant Professor
C. F. Risher, B.S.[‡]	Associate Extension Specialist, York
J. Solis, Ph.D.[*][†]	Assistant Professor
T. C. Stewart, Sr., B.S.[‡]	Associate Extension Specialist
D. E. Turk, Ph.D.[*][†]	Associate Professor
W. S. Walker, M.Ed.[‡]	Associate Extension Specialist, Columbia

Seed Certification

R. H. Garrison, B.S.[†]	Head of Department, Associate Plant Breeder
J. O. Black, Jr., M.S.[†]	Assistant Agronomist
R. A. Jameson, M.S.[†]	Assistant Agronomist

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[*] Teaching staff.
[†] Research staff.
[‡] Extension staff.

COUNTY AGENTS

County	*Name*	*Post Office*
Abbeville	L. H. Bull, B.S.	Abbeville
Aiken	J. H. Evans, B.S.	Aiken
Allendale	W. H. Funchess, M.S.	Allendale
Anderson	H. D. Marett, B.S.	Anderson
Bamberg	D. W. Howe, B.S.	Bamberg
Barnwell	J. B. Griffith, B.S.	Barnwell
Beaufort	W. L. Johnson, M.S.	Beaufort
Berkeley	M. C. Mason, B.S.	Moncks Corner
Calhoun	R. N. Chastain, B.S.	St. Matthews
Charleston	B. S. Lawrimore, B.S.	Charleston
Cherokee	W. A. Ridgeway, B.S.	Gaffney
Chester	D. C. Wylie, Jr., B.S.	Chester
Chesterfield	J. C. Willis, B.S.	Chesterfield
Clarendon	A. D. Grainger, B.S.	Manning
Colleton	J. R. White, B.S.	Walterboro
Darlington	W. J. Gray, B.S.	Darlington
Dorchester	D. E. Epps, B.S.	St. George
Edgefield	J. W. Gilliam, Jr., B.S.	Edgefield
Fairfield	M. H. Lyons, B.S.	Winnsboro
Florence	H. F. Livingston, Jr., B.S.	Florence
Georgetown	H. B. Hardee, B.S.	Georgetown
Greenville	J. K. Jones, B.S.	Greenville
Greenwood	T. J. Bryson, B.S.	Greenwood
Hampton	E. C. Wallace, M.S.	Hampton
Horry	W. D. Witherspoon, B.S.	Conway
Jasper	E. G. Tate, Jr., B.S.	Ridgeland
Kershaw	R. R. Montgomery, B.S.	Camden
Lancaster	F. W. Cannon, B.S.	Lancaster
Laurens	Marett Outz, B.S.	Laurens
Lee	V. F. Linder, B.S.	Bishopville
Lexington	M. A. Bouknight, B.S.	Lexington
McCormick	J. R. Meredith, M.S.	McCormick
Marion	J. L. King, B.S.	Marion
Marlboro	E. C. Abrams, M.Agr.	Bennettsville
Newberry	A. F. Busby, B.S.	Newberry
Oconee	J. C. Morgan, B.S.	Walhalla
Orangeburg	J. C. King, B.S.	Orangeburg
Pickens	J. R. Wood, B.S.	Pickens
Richland	R. W. Bailey, B.S.	Columbia
Saluda	W. H. Craven, Jr., B.S.	Saluda
Spartanburg	W. J. Martin, B.S.	Spartanburg
Sumter	T. O. Bowen, B.S.	Sumter
Union	J. L. Cochran, B.S.	Union
Williamsburg	L. B. Harrington, B.S.	Kingstree
York	C. H. Fant, B.S.	York
Area Agent—Livestock	J. E. Barker, M.S.	Anderson
Area-Agent—Com. and Res. Development	A. L. Padgett	Charleston
Area Agent—Ornamentals	C. W. Thompson, M.S.	Charleston
Area Agent—Livestock	H. L. Eason, B.S.	Chester
Area Agent—Agronomy	R. L. Stephens	Florence
Area Agent—Poultry	J. F. Welter, M.S.	Greenville
Area Agent—Horticulture	J. D. Ridley	Spartanburg
Area Agent—Livestock	B. W. Sherer, B.S.	Spartanburg

ASSOCIATE AND ASSISTANT COUNTY AGENTS

County	*Name*	*Post Office*
Abbeville	J. S. Jones, B.S.	Abbeville
Aiken	F. M. Lollis, B.S.	Aiken
Aiken	W. A. Beasley, Assoc., M.S.	Aiken
Aiken	T. A. Hammond, Assoc., B.S.	Aiken
Allendale	J. E. Cely, B.S.	Allendale
Anderson	N. C. Anderson, Assoc., B.S.	Anderson
Anderson	R. C. McDaniel, Assoc., M.S.§	Anderson
Anderson	G. W. Stewart, Assoc., B.S.	Anderson
Anderson	W. R. Roberts, B.S.	Anderson
Bamberg	E. D. Dean, Assoc., M.S.	Bamberg
Bamberg	D. L. Wilkins, B.S.	Bamberg
Barnwell	B. R. Stepp, B.S.§	Barnwell
Barnwell	J. M. Stout, M.S.	Barnwell
Beaufort	P. T. Seabrook, Assoc., M.S.	Beaufort
Berkeley	R. C. Bacote, Assoc., M.S.	Moncks Corner
Berkeley	W. C. Clinkscales, B.S.§	Moncks Corner
Charleston	J. L. Gowdy, B.S.	Charleston
Charleston	L. M. Muldrow, B.S.	Charleston
Cherokee	H. B. Pasley, B.S.	Gaffney
Cherokee	W. J. Hendrix, B.S.	Gaffney
Chester	C. N. Strange, Assoc., B.S.	Chester
Chesterfield	D. D. Pruitt, B.S.	Chesterfield
Chesterfield	W. P. Yates, B.S.§	Chesterfield
Chesterfield	H. K. George, B.S.	Chesterfield
Clarendon	H. C. Scoville, B.S.	Manning
Clarendon	R. D. McNair, Assoc., B.S.	Manning
Colleton	J. J. Mitchell, Assoc., M.S.	Walterboro
Darlington	C. H. Gray, B.S.	Darlington
Darlington	R. C. DuBose, Assoc., B.S.	Darlington
Darlington	R. C. Smith, Jr., Assoc., B.S.	Darlington
Dillon	C. C .Adams, B.S.	Dillon
Dorchester	F .O. McAlhany, B.S.	St. George
Edgefield	C. R. Tuten, Assoc., B.S.	Edgefield
Fairfield	D. G. Belton, Jr., B.S.	Winnsboro
Fairfield	A. D. Boggs, Assoc., B.S.	Winnsboro
Florence	A. J. Kinder, B.S.	Florence
Florence	J. M. Parnell, Assoc., B.S.	Florence
Florence	Amos Wells, Jr., B.S.	Florence
Georgetown	K. P. Williams B.S.	Georgetown
Greenville	C. K. Palmer, Assoc., B.S.	Greenville
Greenville	F. D. Garrett, Assoc., B.S.	Greenville
Greenville	H. G. Oates, B.S.	Greenville
Greenwood	H. A. Williams, B.S.	Greenwood
Hampton	J. A. Spruill, Assoc., M.S.	Hampton
Horry	Cleveland Sanders, B.S.	Conway
Horry	W. P. Johnson, Assoc., B.S.	Conway
Horry	J. W. Pruitt, B.S.	Conway
Horry	J. L. Brewer, B.S.	Conway
Jasper	H. E. Wilson, B.S.	Ridgeland
Kershaw	B. T. McIntosh, Assoc., M.S.	Camden
Kershaw	C. A. Powell, B.S.	Camden
Lancaster	D. R. Gowan, Assoc., M.S.	Lancaster
Lancaster	C. N. Wilson, Assoc., B.S.	Lancaster
Laurens	T. B. Reeves, B.S.	Laurens
Laurens	A. F. Williams, Assoc., M.S.	Laurens
Lee	L. S. Livingston, Assoc., B.S.	Bishopville
Lee	John Mott, B.S.	Bishopville
Lexington	R. L. Boozer, Assoc., M.Ed.	Lexington
Lexington	W. C. Jones, Jr., B.S.	Lexington

County	*Name*	*Post Office*
Marion	C. A. Brown, Assoc., B.S.	Marion
Marion	M. J. Carter, Assoc., B.S.	Marion
Marlboro	R. C. Smith, Assoc., B.S.	Bennettsville
Marlboro	W. C. Clinkscales, B.S.	Bennettsville
Newberry	J. O. Donkle, Assoc., B.S.	Newberry
Newberry	B. J. Gill, Assoc., B.S.	Newberry
Oconee	M. S. Cely, Jr., B.S.	Walhalla
Orangeburg	J. L. Hayden, Assoc., B.S.	Orangeburg
Orangeburg	Reuel McLeod, Assoc., B.S.	Orangeburg
Orangeburg	Q. J. Smith, Assoc., M.S.	Orangeburg
Orangeburg	Leon Carson, B.S.	Orangeburg
Orangeburg	J. E. Yonce, B.S.	Orangeburg
Pickens	F. M. Fleming, Assoc., B.S.	Pickens
Richland	O. F. Huff, Assoc., B.S.	Columbia
Richland	Charlie Bronson, Jr., Assoc., M.S.	Columbia
Richland	D. B. Dunlap, M.S.	Columbia
Saluda	J. W. Riser, Assoc., B.S.	Saluda
Spartanburg	G. W. Bowen, Jr., Assoc., B.S.	Spartanburg
Spartanburg	Crayton McCown, Assoc., B.S.	Spartanburg
Spartanburg	R. N. Smith, Assoc., B.S.	Spartanburg
Sumter	Arthur Sanders, Assoc., B.S.	Sumter
Sumter	T. B. Tillman, Jr., Assoc., B.S.	Sumter
Union	W. J. Ruff, B.S.	Union
Williamsburg	R. M. Johnston, Assoc., B.S.	Kingstree
Williamsburg	J. F. Fitts, B.S.	Kingstree
York	J. G. Bowman, Assoc., B.S.	York
York	J. D. Williams, Assoc., B.S.	York
York	J. W. Pridmore, B.S.	York

EXTENSION HOME ECONOMISTS

County	*Name*	*Post Office*
Abbeville	Sara M. Glenn, B.S.	Abbeville
Aiken	Alpha C. Jenkins, B.S.	Aiken
Allendale	Barbara O. Lewis, A.B.	Allendale
Anderson	Nancy H. Williams, B.S.	Anderson
Bamberg	Rachel E. Anderson, B.S.	Bamberg
Barnwell	Evelyn S. Williams, B.S.	Barnwell
Beaufort	Vivian C. Gibson, B.S.	Beaufort
Berkeley	Matilda B. von Lehe, B.S.	Moncks Corner
Calhoun	Joann R. Zeigler, B.S.	St. Matthews
Charleston	Lillian R. Goldberg, B.S.	Charleston
Cherokee	Lucille B. Alsing, B.S.	Gaffney
Chester	Judith C. Gaskins, B.S.	Chester
Chesterfield	Lillian D. Rivers, B.S.	Chesterfield
Clarendon	Miriam F. Rigby, B.S.	Manning
Colleton	Emily E. Bridges, B.S.	Walterboro
Darlington	Sara E. Roper, B.S.	Darlington
Dillon	Claire Baker, B.S.	Dillon
Dorchester	Bernice H. Brown, B.S.	St. George
Edgefield	Dorothy O. Herlong, B.S.	Edgefield
Fairfield	Theresa Beckham, B.S.	Winnsboro
Florence	Eleanor M. Foster, B.S.	Florence
Georgetown	Alice N. Milligan, B.S.	Georgetown
Greenville	Mary M. Stone, M.S.	Greenville
Greenwood	A. Louise McColl, B.S.	Greenwood
Hampton	Judith E. Spires, B.S.	Hampton
Horry	R. Violet Navy, B.S.	Conway
Kershaw	Mary S. Day, B.S.	Camden
Lancaster	Nancy C. Patterson, B.S.	Lancaster

County	*Name*	*Post Office*
Laurens	Helen C. Camp, B.S.	Laurens
Lee	Carolyn Meares, B.S.	Bishopville
Lexington	Margaret G. McFadden, B.S.	Lexington
Marion	Sallie M. Smith, B.S.	Marion
Marlboro	Louise Heriot, M.Ed.	Bennettsville
Newberry	Mildred K. Holliday, B.S.	Newberry
Oconee	Julia D. Herron, B.S.	Walhalla
Orangeburg	Huldah P. McKnight, B.S.	Orangeburg
Pickens	Sarah G. Cureton, B.S.	Pickens
Richland	Eleanor W. Jones, B.S.	Columbia
Saluda	Catherine S. Boozer, B.S.	Saluda
Spartanburg	Linda C. Durham, B.S.	Spartanburg
Sumter	Evangeline T. Thompson, B.S.	Sumter
Union	Laura W. Jeter, B.S.	Union
York	Jennie M. Riddle, B.S.	York

ASSOCIATE AND ASSISTANT EXTENSION HOME ECONOMISTS

County	*Name*	*Post Office*
Aiken	Lonieal H. Jackson, Assoc., B.S.	Aiken
Aiken	Kathy L. Arthur, B.S.	Aiken
Allendale	Annie M. Butler, Assoc., B.S.	Allendale
Anderson	Mary M. Thompson, B.S.	Anderson
Anderson	Nancy V. Gary, B.S.	Anderson
Anderson	Cynthia W. Williford, Assoc., M.S.	Anderson
Bamberg	Lillie J. Limehouse, Assoc., B.S.	Bamberg
Barnwell	Edna K. DuPree, Assoc., B.S.	Barnwell
Beaufort	Lillie B. Crosby, Asst., B.S.	Beaufort
Berkeley	Doris T. Dauphiney, B.S.	Moncks Corner
Charleston	Dorthula B. Bonds, B.S.	Charleston
Charleston	Mary Ann DeFend, B.S.	Charleston
Cherokee	Leota S. Littlejohn, B.S.	Gaffney
Chesterfield	Phyllis Bradham, B.S.	Chesterfield
Colleton	Gussie M. Goudlock, Assoc., B.S.	Walterboro
Darlington	Frances K. Mitchell, B.S.	Darlington
Darlington	Joyce D. Byrd, B.S.	Darlington
Dorchester	Cynthia D. Phinney, B.S.	St. George
Edgefield	Mary H. Ouzts, B.S.	Edgefield
Florence	Grace L. Taylor, B.S.	Florence
Florence	Hattie P. Lowery, Assoc., M.S.	Florence
Florence	Sallie M. Moore, B.S.	Florence
Georgetown	Janie Lancaster, M.S.	Georgetown
Greenville	Mary P. Batson, B.S.	Greenville
Greenville	Alma A. Devore, B.S.	Greenville
Hampton	Leona B. Mungin, Assoc., B.S.	Hampton
Horry	Diane N. Hess, B.S.	Conway
Horry	Marian M. Watson, Assoc., M.Ed.	Conway
Jasper	Frances M. Petrie, B.S.	Ridgeland
Lancaster	Jessie J. Shannon, B.S.	Lancaster
Laurens	Nellie K. Harrison, B.S.	Laurens
Lee	Bertha G. Alston, B.S.	Bishopville
Lexington	Jeralyn K. Fallaw, B.S.	Lexington
Marion	Shirley M. Patterson, B.S.	Marion
Newberry	Mary Sue Day, B.S.	Newberry
Newberry	Lillian G. Saunders, Assoc., B.S.	Newberry
Orangeburg	Rosa R. Odom, Assoc., B.S.	Orangeburg
Orangeburg	Margaret A. Culler, B.S.	Orangeburg
Pickens	Sarah E. Richardson, B.S.	Pickens
Richland	Gertrude H. Sanders, Assoc., B.S.	Columbia

County	*Name*	*Post Office*
Richland	Margaret F. Mattox, B.S.	Columbia
Saluda	Myrtice T. Boazman, Assoc., B.S.	Saluda
Spartanburg	Delphine O. Thornton, B.S.	Spartanburg
Sumter	Laura A. Webster, B.S.	Sumter
Sumter	Jacqueline M. McKnight, B.S.	Sumter
Union	Marie P. Wolfe, B.S.	Union
Williamsburg	Eva G. Lawrence, Assoc., B.S.	Kingstree
York	Johnnie G. Sloan, Assoc., B.S.	York
York	Laura J. Gramling, B.S.	York

EXTENSION SERVICE EMERITI

Lora Warner Alford, B.S.	*County Agent Emeritus*
Caroline Simonton Alston	*Home Demonstration Agent Emeritus*
John Chipley Anthony, B.A.	*County Agent Emeritus*
Delphena Wilkerson Arnold, L.I.,	*Assoc. Home Demonstration Agent Emeritus*
Ophelia Sue Barker, B.S.	*Home Demonstration Agent Emeritus*
Benjamin Barnwell	*Associate County Agent Emeritus*
George Washington Bonnette, B.S.	*County Agent Emeritus*
Hugh Asbury Bowers, M.S.	*Extension Horticulturist—Truck Crops Emeritus*
Elizabeth DuBose Boykin, A.B.	*Home Demonstration Agent Emeritus*
Harry Gilmore Boylston, B.S.	*Extension Cotton Improvement Specialist Emeritus*
Lillian Watts Brown, L.I.	*Associate Home Demonstration Agent Emeritus*
George Dewey Butler	*Assistant County Agent Emeritus*
Odil Williams Cain, B.S.	*County Agent Emeritus*
Charles Babb Cannon, B.S.	*County Agent Emeritus*
Claude William Carraway, B.S.	*County Agent Emeritus*
Eleanor DeVeaux Carson, A.B., M.S.	*Home Demonstration Agent Emeritus*
Cammie Fludd Clagett, B.S.	*Associate Home Economist Emeritus*
Mattie Lee Cooley, B.S.	*Home Demonstration Agent Emeritus*
Carl Golden Cushman, B.S.	*Leader Emeritus, Dairy Extension Work*
George Washington Daniel, L.I.	*Associate County Agent Emeritus*
George Washington Dean, M.S.	*Area Agent—Livestock Emeritus*
James Ervin Dickson, B.S.	*Associate County Agent Emeritus*
Spencer Cholier Disher, L.I.	*Associate County Agent Emeritus*
Augustus Lowery DuRrant, B.S., M.S.	*Leader, Livestock Work Emeritus*
James Malcolm Eleazer, B.S.	*Extension Information Specialist Emeritus*
Silas Wightman Epps, B.S.	*County Agent Emeritus*
Samuel Ernest Evans, B.S., M.S.	*County Agent Emeritus*
Paul Bryson Ezell, B.S.	*County Agent Emeritus*
Margaret Barron Fewell, B.A.	*Home Demonstration Agent Emeritus*
Eugene Frederick, B.S.	*Associate County Agent Emeritus*
Rosa Gibbs Gadson, L.I.	*Associate Home Demonstration Agent Emeritus*
Minnie Estha Gandy	*Associate Home Demonstration Agent Emeritus*
Paul Matthew Garvin, B.S.	*County Agent Emeritus*
Percy Harold Gooding, B.S., M.S.	*Leader, Poultry Extension Work Emeritus*
Cecil Pound Goodyear, B.S.	*Associate County Agent Emeritus*
William Roy Gray, B.S.	*County Agent Emeritus*
Mary Catherine Haynie, B.A.	*Home Demonstration Agent Emeritus*
Isobel Patterson Heaton, B.S.	*Extension Home Economist Emeritus*
Elizabeth Herbert, B.A.	*Home Demonstration Agent Emeritus*
Ellie Lanham Herrick, B.S.	*Family Life Specialist Emeritus*
Jesse Howard Hopkins, Sr., B.S.	*County Agent Emeritus*
Julia Stebbins Howerton	*Home Demonstration Agent Emeritus*
Ralph Alexander Jackson, B.S.	*County Agent Emeritus*
Harriett Frazier Johnson, A.B., B.S., M.A.	*State Girls' Club Agent Emeritus*
Laura Connor Johnson, B.S.	*Extension Home Economist Emeritus*
Wayman Johnson, B.S., M.S.	*Associate Extension Specialist —4-H Club Emeritus*
Vernon Morris Johnston, B.S.	*County Agent Emeritus*

Jane Ketchen, B.A.	*Assistant State Home Demonstration Agent Emeritus*
Lonny Inge Landrum, B.S.	*State Home Demonstration Agent Emeritus*
Jamie Tarlton Lazar, B.S.	*District Agent Emeritus*
Thomas Brougham Lee, B.S.	*County Agent Emeritus*
Robert Howe Lemmon, B.S.	*County Agent Emeritus*
Janie Letitia McDill, A.B., B.S., M.S.	*Nutritionist Emeritus*
Henry Abner McGee	*Extension Tobacco Specialist Emeritus*
Elizabeth McNab, A.B.	*Home Demonstration Agent Emeritus*
John Doby Marshall, B.S.	*Associate County Agent Emeritus*
Margaret Martin, B.A., M.A.	*Extension Food Production and Conservation Specialist Emeritus*
Booker Talifero Miller, B.S.	*Associate County Agent Emeritus*
John Dalton Miller, B.S.	*County Agent Emeritus*
Izora Miley	*Home Demonstration Agent Emeritus*
T. W. Morgan, M.S.	*Associate Director of Extension Emeritus*
Sallie P. Musser, B.A., M.A.	*State Home Demonstration Agent Emeritus*
Juanita Henderson Neely, A.B., M.S.,	*State Home Demonstration Agt. Emeritus*
Margaret Myrtle Nesbitt, B.S.	*Extension Home Economist Emeritus*
George Bass Nutt, B.S., M.S.	*Director of Extension Emeritus*
Marian Baxter Paul, B.S.	*Assistant in Home Economics Extension Emeritus*
Houston Stafford Person, B.S.	*Associate County Agent Emeritus*
Theodosia Dargan Plowden	*District Agent Emeritus*
Gertrude Hall Sanders, B.S.	*Associate Home Economist Emeritus*
Portia Seabrook, A.B., M.S.	*Extension Clothing Specialist Emeritus*
Etta Sue Sellers, B.A.	*Home Demonstration Agent Emeritus*
Moses Marcus Sitton, B.S., M.S.	*Associate County Agent Emeritus*
Mahala Jane Smith, B.S.	*Home Demonstration Agent Emeritus*
Vela Mariah Smith, B.S., M.S.	*Extension Specialist —Home Economics Emeritus*
Stiles Conger Stribling, B.S.	*Agriculture Editor Emeritus*
Lena Elizabeth Sturgis	*Home Demonstration Agent Emeritus*
Marguerite Spearman Summer, B.S.	*Home Demonstration Agent Emeritus*
Van Buren Thomas, B.S.A.	*Assistant County Agent Emeritus*
William Thompson, B.S.	*Associate County Agent Emeritus*
Carrie Carson Tomlinson, B.S., M.A.	*Home Demonstration Agent Emeritus*
Ernest Craig Turner, B.S.	*Extension Conservationist Emeritus*
Larkin Vandiville Walker, B.S.	*Associate County Agent Emeritus*
Audley Hoffman Ward, B.S., M.S.	*District Agent Emeritus*
Mabel Price Washington, B.S.,	*Associate Home Demonstration Agent Emeritus*
David Wayne Watkins, B.S., M.A.	*Director Emeritus*
Ernest Nesbit Williams, B.S.	*Assistant in Agricultural Extension Emeritus*

LIVESTOCK-POULTRY HEALTH DEPARTMENT

P. O. Box 1771

COLUMBIA, SOUTH CAROLINA 29202

Director and State Veterinarian

Carl E. Boyd, D.V.M.	Columbia

State Associate Director

John B. Thomas, D.V.M.	Columbia

Federal Assistant Director

John A. Kimsey, D.V.M.	Columbia

Meat Inspection Program

George D. Batcheldor, Sr., D.V.M., *Chief*	Columbia
Lloyd V. Fry, D.V.M., *Assistant Chief*	Columbia
A. F. Allison, D.V.M.	Greenville
William Ginn, D.V.M.	Columbia

A. R. Griffith, D.V.M.	Orangeburg
Gus A. Vaninetti, D.V.M.	Florence

Livestock Laboratory

Bert W. Bierer, V.M.D., *Director*	Columbia
H. Gaffney Blalock, D.V.M., Ph.D.	Columbia
Walter T. Carll, D.V.M.	Columbia
Julian Cornwell, D.V.M.	Columbia
W. T. Derieux, D.V.M.	Columbia
T. H. Eleazer, D.V.M.	Columbia
W. H. Rhodes, D.V.M.	Columbia

Field Veterinary Supervisors

O. E. Baker, D.V.M.	Columbia
D. E. Goodman, D.V.M.	Turbeville
S. L. Moore, D.V.M.	Clemson

State Livestock Law Enforcement Officers

James C. Epps, Jr., B.Sc.	Columbia
Charles L. Fleming, B.Sc.	Columbia
Charles E. Grant, B.Sc.	Columbia

Federal Veterinary Medical Officers

John N. Dalton, D.V.M.	Bamberg
M. L. Gunnels, D.V.M.	Walterboro
J. B. Hendricks, D.V.M.	Columbia
Malcolmn C. Johnson, D.V.M.	Camden
H. A. Jordon, D.V.M.	Timmonsville
J. M. Love, D.V.M.	Chester
Herbert Racoff, D.V.M.	Columbia
Thomas J. Wheelin, D.V.M.	Saluda
Keith N. Wiser, D.V.M.	Greer

THE SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION

The South Carolina Agricultural Experiment Station is the research branch of the College of Agriculture and Biological Sciences. The nucleus of its research planning and efforts are performed by scientists in 16 departments and two special units located on the campus at Clemson. Each department conducts specific research projects in its own field. The findings from these projects are made known to the public through special publication and news releases. Five branch experiment stations, each located in a different area of the state, operate as separate units under the direction and organization of the Clemson station.

The goal of the station is to provide, through research, needed materials, techniques, and information which can result in more effective agricultural production and marketing. The farmer's work can be made easier, cheaper, and more profitable by applying the information obtained through research designed to learn what effect current farm practices have on the financial return he gets. Newer agricultural methods, not yet put into use by farmers, are also studied with the appropriate release of findings.

The opportunity is available, to a limited number of undergraduate students in most of the departments, to work and gain experience in research methods and procedures. Many of the departments also offer Graduate Research Assistantships to students interested in working on a research program while pursuing a graduate degree program in the corresponding discipline.

Laboratories of the station are open for inspection by students, farmers, and the public in general. Information may be requested on any specific problem encountered in Agriculture by writing to the station Director. A full report of the work and expenditures of the South Carolina Agricultural Experiment Station is published annually. This and other publications of the station will be sent, upon request, free of charge.

FOUNDATION SEED AND SEED CERTIFICATION

The South Carolina Foundation Seed Association is charged with the responsibility of increasing breeder seed of adapted Experiment Station and USDA varieties to foundation and registered seed in order that seedsmen and farmers might obtain these varieties at the earliest possible time. There are 16 crops and 55 varieties in the Foundation Seed Program.

The South Carolina Crop Improvement Association inspects and certifies fields for farmers where foundation and registered seed is planted in order that certified seed can be produced.

FERTILIZER INSPECTION AND ANALYSIS

The Fertilizer Inspection and Analysis Division functions as one of the five divisions in the College of Agriculture and Biological Sciences, Clemson University. Since 1893 this division has been procuring official samples and analyzing them to see that the guaranteed analysis has been met, inspecting for proper bag printing and weights of fertilizer. Before any fertilizer is offered for sale in South Carolina, it must be registered with the Fertilizer Inspection and Analysis Division. The director and eight part-time inspectors, who are also deputized as insecticide inspectors, visit all fertilizer and insecticide manufacturing plants. Samples are procured at plants, farms and dealers' warehouses, and as far as possible, in proportion to the sales of individual companies.

Some 6,000 fertilizer samples and 1,800 to 2,000 insecticide samples are procured annually. Normally, the percentage of samples deficient in analysis for fertilizers averages about 8 to 12 percent, with refunds amounting to some $79,000. The penalty refund is made to the ultimate user. In the case of a deficiency in nitrogen the penalty is three times the actual value of the shortage, while for phosphoric acid and potash it is four times the value of the shortage.

The Annual Bulletin contains the following principal items: Fertilizer usage data; the average analytical findings by brand and grades of those samples meeting the guarantee and those not meeting the guarantees—deficient—along with the names, addresses and telephone numbers of all inspectors.

The Agricultural Chemical Services Department performs the analytical work for both fertilizers and insecticides.

THE CLEMSON UNIVERSITY EXTENSION SERVICE

The Clemson University Extension Service is a branch of Clemson University and is a cooperative service supported by the counties, the State, and the Federal government. The Extension Service is responsible for conducting, with all people of South Carolina, the cooperative educational and demonstration programs in agriculture and home economics of Clemson University and the United States Department of Agriculture.

The function of the Extension Service is to make available to farmers, homemakers, and rural boys and girls, through on-the-farm service, demonstrations, meetings, newspaper articles, publications, radio and television broadcasts, and other suitable methods, the results of research and successful farm and home experiences. The Service also assists, through interpretation, practical demonstrations and otherwise, in applying and using this information to improve farms, farm homes, and communities, to the end that a safe, sound, and progressive rural life and agriculture may be built.

The annual plan of agricultural and home economics extension work is developed and carried out with close cooperation between the Extension Service and the farm and home leadership of the State, the counties, and the rural communities and neighborhoods.

The Staff of Agricultural Extension Workers includes the director, associate director, 3 state program leaders, 3 district supervisory agents, an administrative assistant, 46 county agents—one in each county, 10 area agents, 47 associate county agents, 57 assistant county agents, and 69 agricultural specialists in agricultural economics, agricultural engineering, agronomy, 4-H club work, dairying, crop insects and diseases, cotton ginning, forestry, horticulture, animal science, marketing, poultry and turkeys, publications, community and resource development, soil conservation, visual instruction, and television.

The Extension Home Economics Staff includes a state home economics program leader, 3 associate district supervisory agents, an assistant to the state home economics leader, 46 home economists—1 in each county—15 associate home economists, 49 assistant home economists, and 9 specialists in clothing, family life, 4-H club work, home management, nutrition, housing and house furnishings.

LIVESTOCK-POULTRY HEALTH DEPARTMENT

The Clemson University Livestock-Poultry Health Department is consolidated under one Director with the United States Department of Agriculture, Agricultural Research Service, Animal Disease Eradication Division, and is known as the State-Federal Livestock Disease Eradication Program. This department is charged with the control and eradication of contagious, infectious and communicable diseases of livestock and poultry, and with the inspection of meat and meat by-products at slaughtering and processing plants under state inspection. When requested investigations are made, consultations are held and assistance in diagnosis is rendered. This department further organizes, develops, and carries on education programs for the control and eradication of diseases. Quarantine measures are employed to prevent, as far as possible, the introduction or spread of livestock diseases into this state.

The Clemson Livestock Laboratory, a fully equipped modern laboratory staffed with highly trained personnel, is maintained 14 miles northeast of Columbia on U. S. Highway No. 1, at the site of the Sandhill Experiment Station. This laboratory is prepared to assist veterinarians and owners of livestock and poultry in making postmortem laboratory examinations and bacteriological and pathological studies to aid in the diagnosis of diseases. If necessary, sufficient equipment can be sent into the field to diagnose and control disease on the spot.

The administrative office is located in the Livestock Laboratory. Adequate records and identification of livestock are kept. A staff of veterinarians works from the Columbia office, and field veterinarians are located in various sections of the State. In addition to the regular field force of veterinarians directly connected with the Columbia office, practicing veterinarians are commissioned as State-Federal Accredited Veterinarians and assist in the eradication of infectious diseases of livestock. At present there are 132 veterinarians so commissioned and their locations are such that the Clemson University Livestock-Poultry Health Department is in a position to control and eradicate disease promptly and completely in all sections of the State.

This department is required by legislative enactment and supported by legislative appropriation.

THE SOUTH CAROLINA STATE CROP PEST COMMISSION

The act creating the State Crop Pest Commission was passed by the legislature in 1912. According to the act, five members of the Board of Trustees of Clemson University shall compose the Commission.

The purpose of the Commission is to prevent, as far as possible, the introduction into South Carolina of injurious plant pests and to limit the spread of those already within the State. The Commission is also charged with the enforcement of the Bee Disease Act and the South Carolina Economic Poison Law.

The work is performed by the promulgation and enforcement of certain rules and regulations which in the judgment of the Commission are necessary to protect the agricultural interest of South Carolina. The enforcement of the regulations is the responsibility of the State Entomologist, State Plant Pathologist, and their agents.

THE OFFICE OF ENGINEERING RESEARCH

The Office of Engineering Research of Clemson University was established in the College of Engineering in July 1962. Its purpose is to coordinate and stimulate the research activities in the College of Engineering. These activities include the contribution of new knowledge in engineering science by prosecuting a vigorous program of basic research, the conduct of programs of developmental and applied research as a service to the industries of the State, and the determination of uses for the material resources of the State and thereby to encourage the growth of new industries.

The active research staff consists essentially of the faculty members of the College of Engineering and other divisions of the University. The laboratories of all departments, as well as the newly constructed 60,000-square-foot Rhodes Engineering Research Center, are available to the Office of Engineering Research in its investigations.

Research is the foundation for progress in a modern society. The well-equipped physical facilities and the thoroughly competent professional staff available to the Office of Engineering Research constitute extremely valuable resources for continuing and expanding this research effort.

OFFICE OF INDUSTRIAL AND MUNICIPAL RELATIONS COLLEGE OF ENGINEERING

Seminars, workshops, institutes, short courses, and conferences are conducted for engineers of South Carolina and neighboring states. These activities are designed to keep the engineer abreast of changes in modern technology through a non-credit continuing engineering education program sponsored by the Departments of the College of Engineering and coordinated by the Office of Industrial and Municipal Relations.

Recent programs which have been presented include: "Air and Water Pollution Control," "Engineering Application of Digital Computing," "Quality Control and Materials Testing for Highway Engineers," "Solid State Devices in A-C and D-C Motor Control," "Use of Ceramics in Surgical Implants," "Analog and Hybrid Simulation in Industrial Systems Design," "Equipment Selection and Economics," and "Controls and Computations in Power Systems."

All engineering departments participate in the Junior Engineers' Scientists' Summer Institute (JESSI) in which talented high school students receive a 2-week orientation in the Sciences and Engineering.

Refresher courses are coordinated for the National Engineer-in-Training and the Professional Engineer examinations for engineers employed in the Piedmont region of South Carolina.

With the assistance and support of the Department of Environmental Systems Engineering, continuing education programs in environmental control are made available to state, county and municipal agencies and professional organizations such as the South Carolina Water and Pollution Control Association. These programs take various forms, such as the writing of correspondence manuals for water and wastewater treatment plant operators, and conducting schools, workshops and seminars on various topics in environmental control for both the practicing technician and the official charged with the program administration. A national workshop has been co-sponsored with the Federal Water Pollution Control Administration on "Educational Systems for Operators of Water Pollution Control Facilities."

THE OFFICE OF PROFESSIONAL DEVELOPMENT AND INDUSTRIAL RELATIONS

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

One-fourth of the population of the United States will go back to school this year. More and more people including educators, have abandoned the idea that education is something that takes place during a block of time between six and eighteen (or twenty-two). It is lifelong.

The Professional Development Program is one answer to this "fourth dimension" of education. Now over thirteen years old, the program has served over 1,500 persons in one- and two-week long seminars plus hundreds more in various one- and two-day short courses.

The primary aim of the program is to provide a means and a place for business and industrial people from all levels and all areas to come back to the campus and retread their professional skills, to learn new ones, and to sharpen up old ones in the labs, classroom and during "midnight oil" sessions with other professionals.

Drawing on the full resources and faculty of Clemson University, the Professional Development Program for 1969 offered courses from introductory management to high level computer technology. It served an enrollment from 22 different states and two foreign countries, who represented 101 various business and industrial firms. The staff and faculty were secured from 10 different states and represented 5 universities and 25 different corporations.

A high percentage of participants in several of these courses already held their Ph.D., while quite a few had not completed their baccalaureate programs. This further emphasized the realization among professional people that "learning knows no age limit, nor does it know any skill level."

TEACHER EDUCATION

Agricultural Education. The members of the staff of Agricultural Education visit all beginning teachers for the purpose of assisting them on the job and also for the purpose of collecting information which may prove helpful in improving the work of teacher education at the University. In addition, conferences of teachers are held and consulting services made available in the interest of the professional growth of agricultural teachers, the rendering of service to agricultural communities, and the development of leadership among agricultural youth through the program of the Future Farmers of America.

Information concerning any phase of the in-service education activities in Agricultural Education may be secured by contacting the Head, Department of Agricultural Education, Clemson University.

Trades and Industrial Education. The University, in cooperation with the State Department of Education, is glad to assist those who teach vocational subjects in day trade schools and evening trade and industrial classes by supplying a trained man to assist in the work of organizing classes, organizing courses of study, making plans for teaching evening classes, and actually teaching vocational subjects. Requests for information regarding this service should be addressed to Dr. A. F. Newton, Head, Department of Industrial Education, Clemson University, Clemson, South Carolina 29631.

SHORT COURSES AND CONFERENCES

The facilities of the University are made available for special meetings, such as farm groups, rural ministers, religious organizations, and scientific societies; and arrangements are made for special short courses in poultry science, beekeeping, food preservation, cotton classing, dairy science, forestry, water supply and sanitation, ornamental nurseries, etc. Such activities, undertaken in the interest of the general welfare, are encouraged by the University.

CERAMIC ENGINEERING FORUM

The Ceramic Engineering Department, in cooperation with North Carolina State University, sponsors an annual Ceramic Engineering Forum for Ceramic Manufacturers of the Southeast. The meeting place alternates between Clemson University and North Carolina State. This meeting is intended to provide the latest scientific and engineering developments pertinent to Ceramic Manufacturers and to provide a forum for the stimulation of creative thinking.

STUDENT REGISTER

PART VII

GRADUATES OF 1969

ASSOCIATE AND BACHELORS' DEGREES CONFERRED MAY 9, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE DEGREE

Agricultural Economics

Jonathan Leroy Bauer ------------ Andrews
John Joseph Branton ---------------- Seneca
Stephen Lundy Chryst -------------- Conway
Joseph Charles Dawsey -------------- Aynor
* Charles Russell Holland ----------- Clinton
David Joel Jones, Jr. -------------- Columbia
Leon Horace Langley, Jr. -------- Darlington
John Morrison Rooks, Jr. -- Jacksonville, Fla.
William Joseph Steele -------- Arlington, Va.

Agronomy

* John Thomas Bozard ------------- Cameron
** Richard Gaines Dobbins ------- Townville
Delano Van Fraley ---------------- Florence
Sanford Houck, Jr. ----------------- Elloree
David Allen Huckabay -------- St. Matthews
Stanley Jerome McElveen ------ Timmonsville

Animal Science

Thomas Elliott Bonnette, Jr. ---- Orangeburg
Daniel Andrew Durfos ---- Fair Lawn, N. J.
Gary Martin Hill ------------ Flat Rock, N. C.
* Joe White Nickles ---------------- Donalds
Mitchell Myron Willoughby --------- Nichols

Biology

Sarah Thomas Bierley ------------ Lancaster
Norman Leslie Burch, Jr. --------- Lake City
John Emmett Cely ---------------- Columbia
*** Charles Hill Courtney III
------------------------ Albemarle, N. C.
Gerald Lyn Culler ------------- Orangeburg
* John Stephen Culp --------------- Fort Mill
* Glen Gordon Daves ----------- Summerville
* Thomas Wayne Ferguson ------ Graniteville
* Joseph David Gangemi ------ Arden, Del.
* William Kenneth Glenn, Jr. ----------- Starr
Aubrey Jay Gore, Jr. --------------- Conway
Tommy Monroe Hall -------------- Vaucluse
* Thomas Marion Hill ----------------- Union
Paul Mackey Horton ----- Charleston Heights
John Hugh McLaurin III -------------- Dillon
*** Robert Noah Moore ----------- Lexington
Steven Jay Oxler --------------- Charleston
*Dudley Jones Raynal -------------- Clemson
William Patrick Riley -------------- Barnwell
*Johnny Boyd Sandifer -------- Orangeburg
Virginia Dale Sarratt --------------- Gaffney
Fredrick Ronald Scott -------- North Augusta
John Duncan Sherer ----------------- Sharon
Robert Edward Smyth -------- Riverton, N. J.
Pamela Anne Yockey Stevenson -- Greenville
* Cynthia Kay Warner -------------- Clemson

Dairy Science

George Richard Cornwell --- Lattimore, N. C.
Larry Edwin Long --------------- Silverstreet

Food Science

*** Keith Royal Parris ---------- Spartanburg

Forestry

James Patrick Bradley ----------- Albany, Ga.
Gerald Eugene Brockenfelt ------ Charleston
Robert Jordan Counts ----------- Ocala, Fla.
John Douglas Koch --------- Jenkintown, Pa.
Robert Earle Lee, Jr. -------------- Barnwell
Michael William Leonard
-------------------- Poughkeepsie, N. Y.
Allan Bowen Little, Jr. ------ Charlotte, N. C.
Robert Lewis Little ------------- Naples, Fla.
*Dale Martin ------------------ Augusta, Ga.
Robert Julius Phillips -------------- Hampton
John Leighton Porcher --------- Mt. Pleasant
Joseph Snowden Tyson ---------- Charleston
Derryl Leon Walden ------------- Charleston

Horticulture

Stiles Mikel Harper, Jr. ---------------- Estill
Ronald Allison McDaniel ---------- Edgefield
Robert Roger Sherman
------------------ Signal Mountain, Tenn
Joseph Thompson Summer -------- Newberry

Poultry Science

James Robin Foy ---------------- Newberry
Henry Tutt Hahn --------------- Greenwood
Donald Willis Odom -------------- Columbi
* David Lewis Wicker -------------- Pomari

SCHOOL OF ARCHITECTURE

BACHELOR OF ARTS DEGREE

Pre-Architecture

Philip Washington Fairey III ------ Columbia
William Norton Skardon ------- Spartanbur

BACHELOR OF ARCHITECTURE DEGREE

ames Tremel Allen	Spartanburg
hilip Lester Anderson	North Augusta
Vade Hamilton Barber	Pickens
onald Firth Beck	Orlando, Fla.
John Anthony Blackburn	Kingsport, Tenn.
Richard Albert Compton	Falls Church, Va.
larence Wayne Crocker	Union
Harold Eugene Davis, Jr.	Memphis, Tenn.
ecil Meredith Drakeford, Jr.	Sumter
Gary Franceschi	Vineland, N. J.
larry Charles Harritos	Savannah, Ga.
ohn Darnell Hartley	Rockville, Md.
Sallie McKenzie Jackson	Myrtle Beach AFB
Thomas Clark Mozen	Decatur, Ga.
David Leon Narramore	Greenville
Kenneth Thomas Ricket	Greenville
Thomas Wesley Salmons III	Havertown, Pa.
James Schettino	Norwalk, Conn.
Roger Norris Simmons	Greenwood
Fayette Louis Sims	Hartsville
Llewellyn Richard Stephens	Reading, Pa.
John Carroll Stewart	Greenville
Kenneth Edward Whelchel	Gaffney
James Albert Yarborough	Miami, Fla.

BACHELOR OF SCIENCE DEGREE

Building Construction

rederick Charles Bicksler	Sanatoga, Pa.
ames Michael Brittain	Spartanburg
rnest Clifton Brown, Jr.	Sumter
angdon Hastings Dinkins	Sumter
obert Dexter Frey, Jr.	Lancaster, Pa.
Ronald Wayne Garner	Gaffney
Charles Rucker Hipp, Jr.	Charleston
Larry Reed Kendall	Columbia
Donald Gene Lesley	Easley

COLLEGE OF ARTS AND SCIENCES

BACHELOR OF ARTS DEGREE

arry William Abernathy	North Augusta
larion Douglas Aldridge	North Augusta
ohn Manton Alford	Dillon
tanley Boies Angle, Jr.	Kingsport, Tenn.
orothy Mae Ashford	Columbia
Roderick Glen Ayers, Jr.	Nichols
dwin Fleming Bailey	Summerville
Fred Kenneth Baldwin	Taylors
atherine Mary Ballas	Jacksonville Beach, Fla.
Mary Nell Barker	Westminster
avid Lee Baskin	Simpsonville
arris Lewis Beach, Jr.	St. George
ynda Helen Bethea	Cartersville, Ga.
Lewis deVeaux Blake III	Belton
enneth LeRoy Chappell	Central
oliver Davis Christopher, Jr.	Barnwell
avid Ross Clarke	Greenville
ale Thomas Cobb, Jr.	San Loenzo, Puerto Rico
yles Furman Cobb	Starr
** Shirley Ann Couch	Williamston
eorge Moore Covington III	Norway
an Carroll Crenshaw	Kershaw
avid Lee Crenshaw	Kershaw
hn Raymond Davey	North Arlington, N. J.
illiam Earl Dean, Jr.	Greenville
Martha Rozelle Dinwiddie	Clemson
ancy Weill Dixon	Sumter
ephen Newton DuBay	Lancaster
evin John Dyke	Alexandria, Va.
mes Stephenson Eakes	Pendleton
hn Emerson Enslen	Wetumpka, Ala.
John Fernandez	Elberton, Ga.
Ebb Horton Field III	Seneca
* Jonathan Brittain Floyd	Silverstreet
* Janet Kay Garrison	Johnston
William Joseph Gestrich, Jr.	Seneca
Edward Jerome Greene	Spruce Pine, N. C.
* Sandra Leigh Hart	Walhalla
** Dana Lewis Jackel	Atlanta, Ga.
Donald Stephen Kahler, Jr.	Kershaw
Delores Ann Kimes	Columbia
Evron Matt Laitala	Clemson
Jack Alibert LeGrand, Jr.	Winnsboro
* John Allen Martin	Anderson
Walter Davies Merry III	Columbia
Betty Smith Miller	Rome, Ga.
Charles Aaron Newton	Deltona, Fla.
Frances Suzanne Clark O'Neal	Johnston
* Carolyn Skelton Patey	Charleston
Michael Yates Patterson	Easley
Sharon Lynne Planck	Eau Gallie, Fla.
Laura Elizabeth Pratt	Hampton
Wallace Edward Roberts	Anderson
Timothy Folk Rogers	Walterboro
* William Alan Rush	Greenville
Woodrow Geiger Senn, Jr.	West Columbia
Dora Ellen Shelton	Central
Sharon Nathalie Skagseth	Columbia
†** David Errol Thompson	Florence, Ala.
Ronald Adrian Thrower	Mt. Holly, N. C.
Harry Lee Tinsley III	Rock Hill
* James Ronald Vehorn	Anderson
Linda Ann Watts	Westminster
Paul Randall Wright	Spartanburg

BACHELOR OF SCIENCE DEGREE

Chemistry

hn Nichols Adams	Asheville, N. C.
enny Emile Black	Charleston
Robert Fred Bock, Jr.	Clemson
ephen Dewitt Bright	Greer
David Leroy Dean	Warrenville
* Richard Harold Gentry	Bishopville
** Richard Andrew Kaba	Matthews, N. C.

Mathematics

*** Philip George Buckhiester ------ Piedmont
Samuel Livingston Callicott, Jr. --- Ninety Six
*** John Richard Crammer -------- Anderson
* Tillman Wingfield Derrick, Jr. ---- Fort Mill
** Daniel Edgar Duncan ---------- Pageland
* Wade Hardie, Jr. ------ Spruce Pine, N. C.
Charles Irving Houston, Jr. ------ Charleston
Jeffrey Jerome Lapin ------------ Charleston
Thomas Edward McClendon -- Riverdale, Ga.
David Hall Magathan, Jr. ----- Potomac, M
* Jack Ernest Matson -------- Kensington, M
** John Davis Palmer -------------- Clemso
Linda Joyce Pruitt -------------- Norfolk, V
*** James Tompkins Ramey, Jr. -- Honea Pat
** Danny William Turner ---------- Smyrn
Albert Weyman Way
----------------- St. Simons Island, G

Physics

Robert Wellington Blackwell -- Travelers Rest
* George Thomas Fabian -------- Charleston
**Waenard Livingston Miller, Jr. -- Greenville
William Joel Millsap --------------- Easley
Burnett Alexander Pettit, Jr. -- Baltimore, M
* James Daniel Phillips ---------- Greenvill
*** Charles Garrison Shirley, Jr. ------ Gree
Ronald Eugene Speer ------------ Abbevill

Pre-Medicine

John Julian Abbott ----------------- Sumter
Rebecca Ballard ------------------- Easley
David Michael Ballenger -------- Charleston
* Carl Timothy Bessent ------ Baltimore, Md.
William Earl Bishop ,Jr. --------- Greenville
* Edsel Dean Blair -------------- Greenville
* Horace William Bonekat ---- Broomall, Pa.
Frank Templeton Brown ----------- Laurens
Lewis Earle Brown -------------- Ehrhardt
* Max Vincent Bryant --------------- Sumter
John Elliott Carder -------- Front Royal, Va.
James McCown Carroll ------------ Florence
* Joseph William Cullom ---------- Allendale
Brian Samuel Dantzler ------------ Cameron
Jerome Barlow Degen -------------- Sumter
* William Lee Dobbins, Jr. -------- Anderson
* Edward Macdonald DuBose, Jr. ---- Oswego
John Frank Ellenberg, Jr. ------- Greenwood
Lewis William Goldstein ------ Spartanburg
Irwin Goodman ---------------- Charlesto
* Rudolph Cole Harrington, Jr. ---- Winnsbor
David O'Neal Holman, Jr. ------ Timmonsvill
* Kenneth Allen Humphrey
--------------- Croton-on-Hudson, N.
* Gerard Charles Jebaily ---------- Florenc
* Carl Henry Jones III ---------- Great Fall
Douglas Wayne Jones ------------ Columbi
John Conrad Malmgren --- Greensboro, N.
** Marshall Vance Marchbanks ---- Clemso
* John Luther Moore --------------- Nichol
* Charlie Kinchin Potts, Jr. --------- Columbi
Norman Gardelle Rentz, Jr. -------- Varnvill
* Paul Belton Skinner, Jr. ------ Ware Shoal
Robert Joseph Smith ---------- Allentown, P
Robert Hoyle Snoddy, Jr. ---------- Clemso
William Lewis Weber --------------- Unio
James Ryan White III ---------- Walterbor
Larry Carl Young ---------------- Hampto

SCHOOL OF EDUCATION

BACHELOR OF ARTS DEGREE

Elementary Education

Sharon Joan Carrington ---------- Greenwood
Martha Ann Dobbins ---------- Fountain Inn
Cheryl Smoak Fox ------------ Yonges Island
Jo Ellen Gill --------------------- Walhalla
Margaret Ann Knight ---------- Williamston
Mary Ellen Knight -------------- Greenville
** Jane Cobb Lane --------------- Clemson
Nancy Elizabeth Mills ----------- Greenville
* Suzanne McCown Moore -------- Anderso
Linda Gail Prichard ------------ Westminste
Helen Grace Smith -------------- Lancaste
*** Maryann Stackman ----------- Columbi
* Gloria Elizabeth Tate ------------ Anderso
Gloria Jean Thrasher ------------- Anderso
Olivia Hayes Williams ----------- Rock H

Secondary Education

* Virginia Elizabeth Carroll ---- Augusta, Ga.
Sara Elizabeth Chapman ------------ Pelzer
Robert Milton Crain ------------- Greenville
* Edward Wallace Dickerson, Jr.
---------------------------- Spartanburg
Kitty Sue Dill ------------------ Greenville
Constance Louise Gilstrap ---- Brevard, N. C.
** Patricia Anne Heller ------ Sandy Springs
Edward Parker Holliday ------------ Central
** Barbara Ann Hudgens -------- Greenwood
Carrell Anne Hunter ------ Charlotte, N. C.
* Laura Rogers Johnson --------------- Clio
William Ludwig Lacher ---------- Greenville
* Linda Jean Lanham -------------- Clemson
Peggy Huckaby Mellichamp ---- Toccoa, G
* Sandra Harper Mercier --- Copperhill, Ten
** Linda Curran Miller ---------- Greenvil
James Fredrick Reames, Jr. ------ Bishopvil
Ruttland Edward Riddle ---------- Greenvil
Patricia Ann Seawright ----------- Anders
** John Kelley Segars ---------- Bishopvil
Russell Edward Stiegel, Jr. -- Charlotte, N.
* Stanley Hanks Thompson -------- Clems
John Fletcher Townsend, Jr. ---- Bennettsvil
Gary Russell Warner ----- Salamanca, N.
Julian Ray Wates ------------------- Gre
John Albert Woods ----------- Syosset, N.

BACHELOR OF SCIENCE DEGREE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the School of Education.)

*Harry Max DuBose	Myrtle Beach
Donald Daniel Durham	Piedmont
John Charles Horton	Kershaw
John Thomas Meehan, Jr.	Pendleton
James Walker Painter	Chesnee
Willie Durant Sansbury	Conway
James Thomas Shell	Fountain Inn
* Walley Anson Turner	Florence

Industrial Education

* Steward Lynwood Baylor	Kingstree
Eber Johnson Blackwood	Inman
John Douglas Edwards	Spartanburg
Gary Earl Gerhold	Pittsburgh, Pa.
William White Gregory III	Inman
Norman Anthony Howard	Landrum
David Guy Jackel	West Mifflin, Pa.
Gerald Morris Jennings	Ware Shoals
Roger Dayle Jolley	Columbus, N. C.
Odious Odell Knight II	Spartanburg
Micah John LaRoche III	Wadmalaw Island
Ray Ernest Linke	West Orange, N. J.
Milledge Galphin Murray	North Augusta
Charles William Patterson, Jr.	Simpsonville
Paul Joseph Posch	Delran, N. J.
Albert Richard Reid	Greenville
William Johnson Stevens, Jr.	Yonges Island
Richard Marvin Tucker	Enoree
Ronald Earl Whitmire	Marietta

Recreation and Park Administration

Philip David Ackerman	St. George
Helen Louise Bunch	Suffolk, Va.
Marshall Jethro Coleman, Jr.	Darlington
Robert Thomas Dennis	Rembert
Lamar Herman Entrekin	Liberty
Eleanor Dion Fairey	Summerville
Edward Eric Freit, Jr.	Lakewood, N. J.
Robert Wesley Isenhour	Salisbury, N. C.
William Thomas Kissam	Statesville, N. C.
Alan Willis Kuester	Charlotte, N. C.
John Garnett Lawton III	York
John Crawford Lynn	Dillon
Tom Lee Murrell, Jr.	Kingsport, Tenn.
Alvin Benjamin Phillips, Jr.	Graniteville
Barry Carroll Robinson	Augusta, Ga.
Bruce Thomas Rush	Camden
Curtis Alan Shirer	Anderson
Marion Jackson Smith, Jr.	West Columbia
Terrell Parker Spence	Charleston
Craig Mercer Thomas	Georgetown
Ronald Adrian Thrower	Mt. Holly, N. C.
Robert Logan Wilder, Jr.	Sumter
Rosalind Marie Wright	Gastonia, N. C.

Science Teaching

Karen Robey Benedict	Clinton, Md.
James Michael Blackwell	Gaffney
* Becky Scott Carlton	Mullins
Richard Lee Coltman	Knoxville, Tenn.
Patricia Ellen Greenfield	Clemson
Helen Frances Hawkins	Central
Allen Marc Levine	Passaic, N. J.
Betty Chloe Lynn	Greenville
Michael Thomas Voiselle	Fairfield, Calif.

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE DEGREE

Ceramic Engineering

Harry Patterson Adams	Saluda
John McKay Burns	Macon, Ga.
James Gary Childress	Greenville
William Anthony Meister	Union City, N. J.
* Charles Norman Wilson	Worthington, Ohio

Chemical Engineering

Wayne Fulmer Addy	Columbia
Hugh Cook Brown, Jr.	McCormick
William Harold Bruggeman	Savannah, Ga.
*** Charles David Cooper	Winter Park, Fla.
David George Dempsey	Spartanburg
Marion Rollins DeWitt, Jr.	Darlington
** Richard Gready Fessler	Charleston
Joseph Judkins Forbes	Birmingham, Ala.
James William Hannah	Greer
* Howard Michael Herron	Dallas, Texas
Don Keith Johnson	Simpsonville
* Gary McDaniel Johnson	Greenville
* Michael Alan Lake	Jamestown
* David Randall Mayfield	Anderson
Jack Harris Mitchell III	Clemson
* Michael William Osborne	Camden
Owen Charles Robertson, Jr.	Bowersville, Ga.
George Christopher Rodrigues	Fayetteville, N. C.
** James Edward Salamony	Summerville
Ronald Edward Steele	Knoxville, Tenn.
* John Nixon Talbert, Jr.	McCormick
Henry Wedemeyer Theiling, Jr.	Charleston
** Allan James Thompson, Jr.	Charleston
Ray Morgan Thompson	Memphis, Tenn.
Richard Clark Walker	Pittsburgh, Pa.

Civil Engineering

Richard Allen Albers	Mt. Pleasant
Neil Robert Baer	Edgewater, Md.
John William Beeson	Liberty
Ronnie Joe Catoe	Kershaw
Robert Martin Dulin, Jr.	Bowling Green
Paul Curtis Eckard, Jr.	Connelly Springs, N. C.
David Carmichael Fischetti	Brooklyn, N. Y.
* William Jennings Ford, Jr.	Charleston
Kevin Henry Gartland	Arlington, Va.
* Oscar James Gilstrap	Seneca
David Charles Harris	North Charleston
Charles Barry Huckaby	Toccoa, Ga.
Evander Stephens Jones	Nichols
* Anderson Mills Kinghorn, Jr.	Beaufort
James Bigland Kinghorn, Jr.	Beaufort
* Robert Francis Martin	Greenville
James Michael Roach	Oklahoma City, Okla.
Douglas Randolph Rucker	St. Matthews
* Clark Aaron Smith	Madison
Dudley Dunwody Stone	Atlanta, Ga.
Steven Bradley Tipping	Salamanca, N. Y.
Gary J. Ziegler	Columbus, N. J.

Electrical Engineering

Earl Lewis Belcher, Jr.	Aiken
†** David Monroe Bell	Hartsville
* David Blanchard Bullard	Jackson
William Allen Crumpler	Myrtle Beach
William Rowley Dill, Jr.	Greenville
* Terrence Mitchell Easler	Greenwood
Lyle Wilson Fairey, Jr.	Orangeburg
John Edward Frederiksen	Toms River, N. J.
Donald Carl Fulmer	Wagener
Michael John Hillyer	Asheville, N. C.
* Howard McDonald Jones	Greenville
James William Jones, Jr.	Travelers Rest
* Philip Ervin Law	Columbia
* Robert Edward Lemacks	Charleston
* William Edward Miller	Neptune Beach, Fla.
†*** Steve Julius Mitchem	Wellford
†* Felix Joseph Nepveux IV	Charleston
Edward Dominick Nicastri	Orange City, Fla.
David Cummings Nusbickel, Jr.	Winter Park, Fla.
** Richard Albert Schmalz, Jr.	Sudbury, Mass.
William Jeffrey Smith	Newberry
Edward Raney Stokes	Beaufort
Charles Weldon Streett, Jr.	Florence
†** James Everett Thomas	Williamston
Dibbon Keith Walters III	Charleston

Industrial Engineering

James Alan Doss	Chattanooga, Tenn.
David Downes Little III	Spartanburg

Mechanical Engineering

Paul Jerry Barraco	Clintondale, N. Y.
Robert Coleman Blair, Jr.	Columbia
* James Edward Caldwell, Jr.	Belton
Julian Walter Davis II	Westminster
Bruce Miller Dixon	Clinton
** Alan Ray Franklin	Anderson
David Neal Gay	North Augusta
Charles Manly Harbin III	Greenville
Donald Ray Kennedy	Woodruff
Joel Robert Matthews	Ft. Myers, Fla.
William Martin Orr	Greenville
*** Donald Bissell Pounder	North Charleston
Russell Farran Smith	Birmingham, Mich.

Metallurgical Engineering

Roy Charles Dunham	Poughkeepsie, N. Y.
** Joseph Daniel Fickling	Lancaster
Arthur Kenneth Fox	Adams Run

SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS DEGREE

Arts and Sciences

James Clyde Addison, Jr.	Allendale
Alman Lamar Buckalew	Columbia
Jerry Zack Campbell	Landrum
James Glenn Cantrell	Greenville
Robert Newton Church	Travelers Rest
Robert Barnwell Clarkson II	Sumter
James Paul Cromer, Jr.	Sumter
Henry Grady Denton, Jr.	Lancaster
Gordon Ray Edgin	Acton, Mass.
Charles Darrick Ethredge	Charleston
James Allen Ferguson, Jr.	Anderson
* Jamile James Francis, Jr.	Greenville
Donald Charles Frost, Jr.	Macon, Ga.
Alan Goldfarb	Miami Beach, Fla.
Merritt Riggs Goodman, Jr.	Burlington, N. C.
Jeffrey Lynn Hawthorne	Mount Joy, Pa.
David Smith Humberd	Cleveland, Tenn.
Arthur Welling LaGrone, Jr.	Greenville
Henry Dean McAllister, Jr.	Barnwell
Marion Lee Manning	Calhoun Falls
* Larry Swain Merck	La France
Robert Arthur Moffatt	Anderson
Lawrence Terry Owen	Brevard, N. C.
Jonathan Henry Owings	Greenville
Richard Lee Roche	Gaffney
Frank Randall Schmidt	New Hyde Park, N. Y.
Richard Brevard Skilton	Maitland, Fla.
Grover Clyde Stewart, Jr.	Anderson
Joel Allen Strom	North Augusta
* Milton Allen Toole	Greenville
Walter McGee Welch, Jr.	North Charleston
Thomas Asbury Wilson	Anderson

BACHELOR OF SCIENCE DEGREE

Industrial Management

Vernon Wayne Andis	Mauldin
Sam Morgan Barfield, Jr.	Seneca
Richard Preston Black	Anderson
Ronald Lee Blasco	Bronx, N. Y.
Norman Kevin Bryant	Rock Hill
Toby Gerald Chapman	Winnsboro
Harry Earl Childs, Jr.	Seneca
Jennings Bennett Collins	Greenville
William Vinson Cummings	Spartanburg
Benjamin Harold Cuttino, Jr.	Lithonia, Ga.
Danny Ray Davis	Pelzer
Jesse Frank Dillard	Taylors
Paul Winfree Dowdy	Clemson
James Albert Dye	Anderson
Calvin Lynn Farmer	Greenville
Richard Lartique Garick	Orangeburg
Beaufort Charles Hallman, Jr.	Denmark
James Wallace Huckaby	Roebuck
Tony Allen Jones	Charleston Heights
Thomas Leland Jones	North Augusta
Robert McGee Jordan	Hartsville
Dennis Leroy Joye	Charleston
Harvey James Kinder	Kingstree
George John Knight	Varnville
Whitner Kilpatrick Livingston III	Mauldin
David Wade Mayes	Aiken
Grover Eugene Myers III	Portsmouth, Va.
Obert EuGene Olson	Sunburg, Minn.
Garry Curtis Phillips	Hartwell, Ga.
Thomas Edward Pospisil	Bloomfield, N. J.
Walter Eugene Riggs	Madison, Ohio
John Howard Robuck	Spartanburg
Roy Dayne Smith	Ninety Six
James Kirby Snead, Jr.	Greenwood
Hampton Broadus Steedly, Jr.	Charleston
Theodore Henry Steiner	Pittsburgh, Pa.
John Hall Waddell	Hendersonville, N. C.
Lawrence Reed Watson	Greenville
Fredrick Donald Welch, Jr.	Columbia
Larry Franklin Whitfield	Anderson
Danny Ray Wilson	Fort Mill
Ronald Allen Wingard	Lexington

Textile Chemistry

** Terry Kenneth Anderson	Edwardsville, Ill.
* James Edward Bostic, Jr.	Bennettsville
Thomas Jones Clayton	Campobello
George Albert Todd, Jr.	Asheville, N. C.

Textiles

William Thomas Jackson	York
Vernon Alton Robbins, Jr.	Rock Hill
* William Milton Sibley	Rock Hill
* Ronald James Small	Bethune
Donny Lee Smith	Rock Hill
Ronnie Alton Smith	Honea Path

SCHOOL OF NURSING

ASSOCIATE IN ARTS DEGREE

Nursing

Elizabeth Ann Blackmon	Bowersville, Ga.
* Sarah Josephine Blackmon	Greenville
* Harolyn Faye Bratcher	Belton
* Martha Karen Buckner	Union
* Victoria Gidaro Caldwell	Spartanburg
** Brenda Marcine Calloway	Forest City, N. C.
Judy Cleveland	Elberton, Ga.
Alice Lorraine Culbertson	Honea Path
* Judith Babb Davis	Greenwood
Sandra Ann Dossey	Sumter
Harriet Ann Hall	Anderson
Nancy Luellen Hicks	Aiken
Mary JoAnne Knight	Honea Path
Wanda Gail Mason	Anderson
* Susan Rebecca Tyndall	Clemson
Sandra Jean Yeargin	Elberton, Ga.

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* With honor

** With high honor

*** With highest honor

†With departmental honors

MASTERS' DEGREES CONFERRED MAY 9, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE DEGREE

Agricultural Economics

Dan Lucien McLemore -------- Surrency, Ga.
Kimrey Dayton Newlin -------- Liberty, N. C.

Animal Science

Daniel Edward Ramage ----- Pittsburgh, Pa.

Entomology

Howard Roy Harris ---------- Queens, N. Y.

Horticulture

Mack James Fleming ------------ Charleston

Plant Pathology

Christopher Randall Freeman -------- Sumter
William Timothy Mercier --- Blue Ridge, Ga.

Zoology

Herbert DeWitt Blackwood ----- Spartanburg
Mary Lang Olson Edwards ------ Greenville

COLLEGE OF ARTS AND SCIENCES

MASTER OF ARTS DEGREE

English

Mary Sue Jones -------------------- Taylors

MASTER OF SCIENCE DEGREE

Chemistry

Samuel Jones Price III ---- Birmingham, Ala.

Mathematics

Amos Trice Brown, Jr. --------- Levittown, Pa.
Richard Bryan Evans ---- Ridgewood, N. J.
Charles Jeffrey Reese ------------- Rock Hill
Donald Robert Russell ----------- Greenville
Billie Ben Smith, Jr. -------- Shreveport, La.
John Lee Wilkins -------------- Athens, Ga.

Physics

James Edward Payne -------- Chase City, Va.
Forrest James Woods -------- Brookfield, Ill.

SCHOOL OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION DEGREE

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the School of Education.)

Jack Percy Corn ------------------- Mauldin

MASTER OF EDUCATION DEGREE

Mary Helen Bennett Acker ------- Greenville
Donald Houston Batson -------------- Easley
Edna Coker Bush ------------------- Easley
Kathie Robbins Butler ------------ Rock Hill
Mary Gillespie Fowler ------------ Greenville
Lillian Brown Glenn -------------- Anderson
Elizabeth Lynch Lashley ---------- Rock Hill
Wilma Smith Murphree ------------ Walhalla
Allene Coker Peden ------------- Greenville
Jean Underwood Phillips --------- Walhalla
George Wyatt Thompson --------- Anderson
Annie Stephens Tribble ---------- Anderson
Edith Wiles Williams ------------- Anderson

COLLEGE OF ENGINEERING

MASTER OF SCIENCE DEGREE

Ceramic Engineering

Martin Milner Cooper ------ Thomasville, Ga.
Erik Francis Croen --------- Asheville, N. C.
Donald Lee Hindman ------------- Walhalla
John Michael Jenkins ------ Montgomery, Ala.
Christian Dallas Talbert ------ Venice, Fla.

Chemical Engineering

Rudolf Othmar Friederich ------- Mobile, Ala.
Hermogenes Moreno
------------ Puerto San Jose, Guatemala

Civil Engineering

Sheong San Liao ------------ Taipei, Taiwan
Chuan Chung Lin ---------- Taipei, Taiwan
Leo Richard Smith --------- Cheyenne, Wyo.

Electrical Engineering

Luther Lee Joyner ------------ Savannah, Ga.
William Ray Sutton ----------- Myrtle Beach
David Oliver Ward -------------- Kingstree

Engineering Mechanics

William Jacob Craft ---- Rutherfordton, N. C.

Water Resources Engineering

William Harold Allen ----Waynesville, N. C.
Donald Hugh Higgins ----- Asheville, N. C.

SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF ARTS DEGREE

Economics

Samuel Jacob Montgomery ------- Chappells

MASTER OF SCIENCE DEGREE

Industrial Management

Ben Terry Clark III ------------- Charleston
James Wilton Orr --------------- Greenville
Perry McCallum Parrott, Jr. ------ Greenville
Brent Eric Zepke -------- Haddonfield, N. J.

Textile Chemistry

Warren Sumner Perkins ------------ Elloree

Textile Science

Woodrow Parker Greene ---- Marion, N. C.

DOCTORS' DEGREES CONFERRED MAY 9, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY DEGREE

Agricultural Economics

Henry Cornelius Gilliam, Jr. -- Raleigh, N. C.
B.S., M.S., North Carolina State University
Dissertation: An Analysis of the Valuation of Agricultural Land in Cotton-Producing Areas of the South Carolina Coastal Plain

Agronomy

Jerry Clyde Walker -- Pharr, Texas
B.S., Pan American College
Dissertation: Effects of Trifluralin and Inorganic Salts on the Growth of Seedling Cotton

COLLEGE OF ARTS AND SCIENCES

DOCTOR OF PHILOSOPHY DEGREE

Chemistry

Frank Garnett Cowherd III -- North Laurel, Md.
B.S., Duke University
Dissertation: Iron Pentacarbonyl Catalyzed Isomerization of Unsaturated Alcohols: The Mechanism of 1,3-Hydrogen Shifts

Randolph Bruce Huff -- Clinton
B.S., Furman University; M.S., Clemson University
Dissertation: I. Reactions of Hydrogen Chloride Gas with Solid 1,10-Phenanthroline and 2,2-Bipyridine Transition Metal Compounds II. Reactions of Hydrogen Chloride Gas with Solid beta Diketone Copper (II) Compounds

Billy Thomas Upchurch -- Rocky Mount, N. C.
B.S., North Carolina Wesleyan College; M.S. Clemson University
Dissertation: A Study of the Alkaline Earth Chelates, of the Optically Active trans-Cyclopentane-1,2-diaminetetraacetic Acid

Mathematics

Harold Braun Reiter -- New Orleans, La.
B.S., Louisiana State University; M.S., Clemson University
Dissertation: On Embeddings of Topological Spaces in a Product of Real Number Line

Arthur Godwin Sparks --- Brooklet, Ga.
B.S., Georgia Southern College; M.Ed., University of Georgia; M.A., University of Florida
Dissertation: Intersections of Maximal Ln Sets and the Generalized Convex Kernel

Physics

Thomas Leo Ferrell -- Anniston, Ala.
B.S., Auburn University
Dissertation: The Equation of Motion for a Particle in an Arbitrary Gravitational Field

Robert Riggs Marchini --- Antioch, Ill
B.S., DePaul University
Dissertation: Energy Gap Measurements in Thin Superconducting Films

John Thaddeus Rompala -- Chicago, Il
B.S., DePaul University
Dissertation: A Nuclear Scattering Theory

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY DEGREE

Engineering

John Lyall Taggart .... Clarksville, Md.
B.S., Tri-State College; M.S., Carnegie Institute of Technology
Dissertation: Gradient Optimization Techniques and the Economic Dispatch Problem (Field of Specializaton: Mechanical Engineering)

SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY DEGREE

Engineering Management

Donald Lee Haney .... Decaturville, Tenn.
B.S., Massachusetts Institute of Technology
Dissertation: A Statistical Interpretation of the Shift-Share Technique and Its Application to Mult-stage Regional Analysis

Joseph McRae Mellichamp .... Toccoa, Ga.
B.I.E., Georgia Institute at Technology
Dissertation: A Model for Estimating the Secondary Benefits to a Regional Economy Resulting from Development of a Water Resource

HONORARY DEGREES CONFERRED MAY 9, 1969

DOCTOR OF HUMANE LETTERS

Clarence Hugh Holman .... Chapel Hill, N. C.

DOCTOR OF LAWS

Hugh Pate Harris .... Charleston, S. C.
Jenkin Lloyd Jones .... Tulsa, Okla.
Hubert Bond Owens .... Athens, Ga.

DOCTOR OF SCIENCE

Wilson Alvin Reeves .... New Orleans, La.

ASSOCIATE AND BACHELORS' DEGREES CONFERRED AUGUST 9, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE DEGREE

Agricultural Economics

Curtis Cavney Kimbrell III ---------- Sumter

Agronomy

Kenneth Franklin Hines --------- Greenville

Animal Science

Robert Allen Brooks, Jr. ------------ Landrum
John Cecil Pardue, Jr. -------------- Johnston
Joel Kenneth Richardson ----------- Clemson
William Henry Wise, Jr. ---------- Rock Hill

Biology

Furman Henry Alewine ------------- Taylors
** Herbert Wayne Beam ------------ Chester
Gretchen Howell Belser ----------- Columbia
Heyward Belser Douglass --------- Columbia
George Alston Gore -------------- Columbia
David Lee Hilsman ------------ Atlanta, Ga.
James Evans Mayer --------- Little Mountain
Ronald Brian Ritchie -------- Kennesaw, Ga.
Julian Stanley Schraibman ------ Charleston
Everett Albert Taylor --------------- Sumter
Stephen Charles Thomas -------- Honea Path

Horticulture

Wilson Counts Childers, Jr. ------ Great Falls
Donald Lee Skelton --------------- Clemson

SCHOOL OF ARCHITECTURE

BACHELOR OF ARCHITECTURE DEGREE

Gregory Paul Benz --- Jackson Heights, N. Y.
William Hunter O'Cain --- Hendersonville, N. C.
Orville Van Player III -------------- Sumter

BACHELOR OF SCIENCE DEGREE

Building Construction

Dan Gerald Askins, Jr. ----------- Hartsville
Jack Warren Burgess ------------ Cleveland
David William Cecil II --------- Spartanburg
Thomas Marion Fitts --------------- Gaston
William Silas Turbeville, Jr. ------ Columbia

SCHOOL OF EDUCATION

BACHELOR OF ARTS DEGREE

Elementary Education

* Diane Porter Bishop ------------ Greenville
* Christine Jackson Ferguson ------ Greenville
Karen Bernadette Lutz --------- Pittsburgh, Pa.
Christine Anne Mercier -------- Summerville
Cheryl Galgoci Miller ------------ Niles, Ohi
* Kathy Brock Welborn ----------- Anderso
Cheryl Simpson Whitfield ---------- Clemso

Secondary Education

Mary Jane Braswell Albea ------ Rockmart, Ga.
William Perry Beckham III ---------- Camden
* Judith Roberts Clarke ------------ Greenville
Rebecca Ann Fortner -------------- Anderson
Laura Anne Hayes --------------- Anderso
* Betty Gleaton Moore ------------ Anderso
Vivian Louise Nichols ------------ Tamasse
Elizabeth Marie Palmer ----------- Townvil

BACHELOR OF SCIENCE DEGREE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the School of Education.)

Alfred Randolph Clarke ------------- McColl
Larry Eugene Greer --------------- Anderson
Martin Howard Hutto ------------- Swans

Industrial Education

Raymond Sylvester Fedele -- Somerville, N. J.
Daniel Lawrence Fry -------------- Kingstree
Cleveland Adger Huey ------------ Anderson
William Jackson Singletary ------- Lake City
Louis Paul Stith, Jr. -------- Sullivans Islanc
James Harold Stoner, Jr. ------------ Enoree
Dennis Holland Walsh ------- Savannah, Ga.

Recreation and Park Administration

Nancy Sharon Alley -------------- Columbia
Robert Earle Ambrose -------- Omaha, Nebr.
Alec Darwin Blalock -------------- Camden
Thomas Edward Bulwith ----- Bayonne, N. J.
James Cecil Catoe, Jr. ------------- Kershaw
Joe Barry Cockfield -------------- Abbeville
Richard Hunter Crouch -------------- Saluda
Stanley Bruce Edens -------- Moncks Corner
Nicholas Fletcher III ------- Charlotte, N. C.
Thomas Kirkpatrick Gaither, Jr. ---- Fort Mill
*Alan Berry Hiatt ------------------- Greer
*Angelina Spearman Howard ------ Clemson
Virgil Finch Linder, Jr. ---------- Bishopville
John Edward Mann --------------- Rock Hill
Hinton Arnold Price, Jr. ---------- Greenville
Simeon Pinckney Wright, Jr. -------- Sumter

Science Teaching

Thomas Murray Arant ------------ Fort Motte
Lawrence Joseph Delaney, Jr.
---------------------- Colchester, Conn.
Andrew Patrick Inabinet -------- Orangeburg

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE DEGREE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

John Wayne Mishoe ------------------ Loris

Ceramic Engineering

James Franklin Ramsay -------- Simpsonville
*Thomas Earl Smith -------------- Anderson
Frankie Darrell Wilson ------------ Anderson

Chemical Engineering

William Jackson Blanks, Jr. ------- Rock Hill
Stephen James Hayes -------- Moncks Corner
John Eugene McAliley ------------ Rock Hill
Samuel Eugene Smith ------------- Rock Hill

Civil Engineering

William Noah Burley, Jr. ---------- Walhalla
Michael Wayne Foster ---------- West Union
*Richard Marvin Garris ------------ Marion
George Fouad Kammoun --- Tripoli, Lebanon
William Nicholas Kellahan, Jr. ---- Kingstree
Robert McFaddin Marshall ---------- Sumter
Randy Gerald Parris --------------- Gaffney

Electrical Engineering

*Fred Marshall Alexander, Jr. ---- Abbeville
Richard Ernest Frank ----- Panama, Panama
Charles Roy Gregory -------------- Waterloo
*James Richard Kirby ----------- Greenville
William Calhoun Locke, Jr. -------- Rock Hill
George Peter Lynch ---------- Arlington, Va.
John Fike Mabry, Jr. ------------- Fairforest
Joseph Horace Simpson III -------- Whitmire

Industrial Engineering

Mir Zulfiqar Rahim ------- Lahore, Pakistan
Ernest Little Spears ----------------- Union
Rollin John Stickle II ------------- Columbia

Mechanical Engineering

Richard James Belken ---------------------
---------- Fort Walton Beach, Fla.
Youssef Fouad Boutros --- El-Koura, Lebanon
James King Brinkley -------------- Columbia
Milton Andrew Gatlin ------------ Newberry
Peter Henry Johnson ------ Glen Head, N. Y.
Robert Joseph Stanzione ---------- Hartsville

SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS DEGREE

Arts and Sciences

Carl Montgomery Allen ---------- Charleston
Robert William Ayers ---------- Orangeburg
Glenn Gray Burdette ------------ Greenville
Ray O'Brian Carter --------------- Columbia
Charles Michael Craven ---------- Greenville
William Ronald Hinson ----- Charlotte, N. C.
Terry Louis Lee ---------- Greensboro, N. C.
Bruce Temple Linthicum ---- Memphis, Tenn.
Gregory Allen McClure ------ Charlotte, N. C.
Charles Ronald Mauney -------------- Greer
Joseph Edward Netzel, Jr. ---- Concord, N. H.
Richard Samuel Proctor, Jr. ---------- Sumter
William Ted Robertson ---------- Spartanburg
Walter Preston Thompson ------ Spartanburg
James Andrew Vaughan -------- Greenville
Prince Otto Wilson, Jr. ----------- Greenville

BACHELOR OF SCIENCE DEGREE

Industrial Management

William Leroy Abercrombie, Jr. ------ Easley
Benjamin Edward Abernathy ---------------- Connelly Springs, N. C.
Bruce Burgess Albea -------- Rockmart, Ga.
Paul Franklin Baker -------------- Piedmont
Stephen Lee Barbery ----------- Simpsonville
Gregg Alcon Belknap ------------ Charleston
Edmond Brown, Jr. ------------------- Elliott
James Abraham Bruce, Jr. -------- Lake View
Terry Lee Cameron -------------- Ninety Six
Donald Brian Cashin ----------- Orangeburg
George Rembert Crowe -- Anchorage, Alaska
Lawrence Bruce Ellefson ------- Spartanburg
Ronald James Hathazy ------ Pittsburgh, Pa.
George David Howell ------ Asheville, N. C.
Richard Wooten Johnson -------- Plains, Ga.
* James Michael Klosky ----------- Anderson
Richard Linwood Lavender ---------- Gaffney
Michael Bryan McKeown -------- Great Falls
Clyde Michael Moore ------------ Greenville
Craig Russell Morrison ----- Fairhaven, N. J.
William Cone Peters ------------ Charleston
Steven McKell Phillips -------- North Augusta
Perry Howard Reynolds ------ Anniston, Ala.
Wayne Jackson Roberson ---- Asheville, N. C.
William Henry Scoggins ---------- Greenville
John Henry Segars -------------- Darlington
Dennis Gerald Shealy ----------- Greenville
Jimmy Dyran Speer -------------- Anderson
* Robert Marion Thomason ---------- Laurens
Charles Bergen Wilson ------------ Camden

Textile Chemistry

Thomas Anthony Tantillo ---- North Augusta

Textiles

Pascal Servene Brock ---------------- Belton

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS DEGREE

Nancy Diana Ball --------------- Simpsonville
** Awtry Stephen Dawes --------- Greenville
William Brunson DePass, Jr. ------ Rock Hill
Charles William Gibson ------ Newton, Mass.
Robert Lee Griffin III ----------- Norfolk, Va.
Kathryn Scott Hanna ------------ Greenwood
Cheryl Denise Jensen ---------- Myrtle Beach
Pamela Joy King ------------ Simpsonville
Mary Delia Mackay Lawton ---- Orangeburg
** Nancy Evelyn McGill ----------- Anderson
George Glenn Matthews, Jr. ------- Columbia
* John McKey Milling ------------ Darlington
Hugh Deaver Putnam, Jr. -- Cherryville, N. C.
** Sara Golden Skardon ------------ Clemson
Paul Jeffrey Steinfeldt ------ Rochester, N. Y.
John Marshall Swails ------------- Kingstree
Richard Hill Woodward ---- Knoxville, Tenn.

SCHOOL OF NURSING

ASSOCIATE IN ARTS DEGREE

Nursing

* Linda Faye Willis ------------- Greenwood

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

BACHELOR OF SCIENCE DEGREE

Chemistry

Donald Milton Boggs	Clemson	William Earle Glazener	Greenville
James Michael Davis	Greer	Lester Yerby Pilcher	Columbia

Geology

* Thomas McLeod Goforth	Rock Hill

Mathematics

Marilyn Jean Jones	Rocky Mount, N. C.	Jeffrey Alan O'Cain	Columbia
John Augustus Neuffer	Clayton, N. Y.	Jeff O'Donnell Pritchard	Sumter
Walter Lawrence Northrup	Wilmington, Del.	William Henry Turner	Columbia

Physics

Edward Licus Prater	Westminster

Pre-Medicine

Richard Leon Beauvais, Jr.	Cranston, R. I.	William Rhodes Holland	Greenville
Arthur Thomas Craig	Greer	Peter Wischan Moxon	Columbia

---

* With honor

** With high honor

MASTERS' DEGREES CONFERRED AUGUST 9, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE DEGREE

Agricultural Economics

James Carl Jordan	Aiken
Tommy Cleveland Meadows	Franklin, N. C.
Gary Frank Young	Smithville, Tenn.

Animal Science

Ralph Duane Roland	Weiser, Idaho

Forestry

Ansel Eldon Miller	Picayune, Miss.

Plant Pathology

Sharon Ursula Brown Miller	Travelers Rest

Zoology

James Joseph Colcolough, Jr.	Mt. Pleasant
Jay Dee Hair	Newark, Del.

SCHOOL OF EDUCATION

MASTER OF EDUCATION DEGREE

Katherine Gardner Adkins	Ninety Six
Judith Belk Askins	Hartsville
Don Raye Beck	Anderson
Terry Leigh Brogdon	Mt. Pleasant
Elaine Hicks Chambers	Liberty
Rebecca Meredith Chamblee	Anderson
Carole Bryant Coker	Greenville
Ella Perrin Cox	Abbeville
Mary Bass Crum	Denmark
Anne Cuba Fletcher	Marietta, Ga.
Suzanne Kaye Ginther	North Canton, Ohio
Ruth Dunlap Jackson	Greenville
Robert Loie Jones	Pelzer
Linda Tune Leatherman	Morganton, N. C.
Helen Chamblee Lee	Anderson
Frances Holtzclaw Lockaby	Travelers Rest
DaCosta Muckenfuss, Jr.	Summerville
Daneille Touchberry Muckenfuss	Greenville
Louise Klugh Rankin	Anderson
Earle Franklin Rochester	Walhalla
Martha Messman Stearns	Atlanta, Ga.
Faye Robertson Walls	Slater

MASTER OF INDUSTRIAL EDUCATION DEGREE

Ephriam George Cope, Jr.	Newberry
Charles Edward Dumas	Forsyth, Ga.
Ernst Allen Neumeister	Charleston

COLLEGE OF ENGINEERING

MASTER OF SCIENCE DEGREE

Ceramic Engineering

Robert Brown Clem	Huntsville, Ala.

Chemical Engineering

Moa Tseng William Chien	Taipei, Taiwan
James Thomas Haney	Lyman

Civil Engineering

Philip Howard Clarkson	Cowpens
James William Page	Lake View
Neil Arden Smoak	Orangeburg

Environmental Systems Engineering

James Malcolm Campbell ----- Bucyrus, Ohio
David Mitchell Cline -------- Wytheville, Va.
Lawrence Charles Tropea, Jr. -- Buffalo, N. Y.
Charles Kein Yee ---------- Birmingham Ala.

Water Resources Engineering

Joseph Richard Briggs ---- College Park, Ga.

SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF SCIENCE DEGREE

Industrial Management

Joseph Larry Avant ------------- Charleston
Raymond Wayne Davies -- Saddle Brook, N. J..

Textile Chemistry

Scott Bruce Speares, Jr. ---------- Anderson

Textile Science

Johnny Mack Butler -------------- Rock Hill

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS DEGREE

English

Kenneth Charles Burrows ------------------ Nottingham, England
Laurens Hunter Irby ------------- Woodruff
Frank Walter Pearce, Jr. ----------- Cheraw

History

Noel David Evans --------------- Greenville
Elizabeth Merritt Haw ------- Thibodaux, La.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

MASTER OF SCIENCE DEGREE

Mathematics

Gordon Lee Bailes, Jr. ---------- Greenwood
Cheryl Elaine Henderson ------ Bogalusa, La.
Amelia Nichols Richardson ---------- Clinton

Physics

Charles Lee Watlington ------ Jackson, Tenn.

DOCTORS' DEGREES CONFERRED AUGUST 9, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY DEGREE

Agricultural Economics

Robert Henry Elrod .... Griffin, Ga.
B.A., Presbyterian College; M.S., Clemson Uuniversity
Dissertation: Development and Use of Updated Input-Output Tables in Economic Forecasting and Planning

Entomology

Wesley Wright Gregory, Jr. .... Anderson
B.S., Wofford College; M.S., Clemson University
Dissertation: Bioaccumulation of Endrin from Natural Food Sources in the Eastern Bobwhite Quail, **Colinus virginianus virginianus L.**

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY DEGREE

Engineering

Asa Orin Bishop, Jr. .... Pocahontas, Va.
B.S., Virginia Military Institute, M.S., Clemson University
Dissertation: The Development of an On-Line Real Time Digital Computer Technique for the Analysis of Electroencephalograms (Field of Specialization: Electrical Engineering)

Conor Deane Johnson .... Orange, Va.
B.S., Virginia Polytechnic Institute; M.S., Clemson University
Dissertation: On the Dynamic Stability of Simply-Supported Rectangular Sandwich Plates and Circular Cylindrical Sandwich Panels (Fields of Specialization: Engineering Mechanics)

Billy Howard Kornegay .... Powhatan, Va.
B.S., Virginia Military Institute; M.S., Clemson University
Dissertation: Characteristics and Kinetics of Fixed Film Biological Reactors (Field of Specialization: Environmental Systems Engineering)

SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY DEGREE

Engineering Management

Edward Romfh Clayton .... Blacksburg, Va.
B.S., University of Florida
Dissertation: Estimating Distributed Lags in the Demand for Money

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

DOCTOR OF PHILOSOPHY DEGREE

Chemistry

Ronald Edward Block .... Gainesville, Fla
B.S., College of Charleston; M.S., Clemson University
Dissertation: Determination of the Microstructure of Copolymers of Vinylidene Chloride and Methacrylonitrile

Nina Griffin Charles ---------- Kinston, N. C.
B.A., Agnes Scott College
Dissertation: Investigation of the Quasi-Linear Model and its Application to the Bending Vibration of Sulfur Dioxide

Mathematics

Harry Hammond Suber ---------- Jackson
B.S., M.S., Clemson University
Dissertation: Integral Manifolds for Perturbed Nonlinear Systems

Physics

Barry Leeds Illman ---------- Fairfield, Conn.
B.S., Tennessee Polytechnic Institute; M.S., Clemson Univeristy
Dissertation: The Generally Covariant, Non-Divergent Equations of Motion of a Charged Particle

Donald Eugene Kinkaid ---------- Joy, Ill.
B.S., M.S., Clemson University
Dissertation: A Numerical Analysis of the Inelastic Scattering of Nucleons from Lithium-Seven

ASSOCIATE AND BACHELORS' DEGREES CONFERRED DECEMBER 18, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE

Agricultural Economics

William Kenneth Orr --------------- Clinton

Agronomy

Alton Beasley Jeffords -------------- Lamar

Animal Science

Lewis Daniel Malphrus, Jr. -------- Clemson
Clark Edwin Woods ---------- Fountain Inn

Biology

Franklyn Curtis Allen ----------- Greenville
Paul David Amos ------------ North Augusta
Roy Truett Greene ------------------ Easley
Daniel Edward Meyer -------- Ramsey, N. .J
Lucas Randolph Peele, Jr. ------- Bishopville
**Joseph Eugene Sabaitis, Jr. --- Carlisle, Pa.
David Craig Sheppard -- Winston-Salem, N. C.
*Darra Dane Williamson -------------- Loris
*Judith Carol Wolper ---------- Summerville
Norman Henry Woods, Jr. -- Dowingtown, Pa.

Dairy Science

*Frank Kirby Bridwell -------------- Taylors
Herbert Tarrant Corbett, Jr. ------ Springfield
Ronald Edward Ducworth -------- Anderson

Forestry

John Kenneth Boland -------- North Augusta
Ludie Munn Coleman III --------- Lake City
William Thomas Crain --------------- Greer
James Othol Holcombe -------------- Easley
Frank Kostyra ---------------- Nutley, N. J.
David LaGrone Tompkins, Jr. ----- Edgefield

Horticulture

James Vincent Caggiano ---------- Cowpens
Thomas Vernon Nickless ----------- Central
*Suzanne Perry Pearman -------- Anderson
*Elizabeth Hamlin Schirmer ---- Mt. Pleasant
Kenneth Boyd Simmons, Jr. ------- Columbia

Poultry Science

Hugh Lee Gault ------------- Simpsonville
Roger Neron Langley ---------- Johnsonville

COLLEGE OF ARCHITECTURE

BACHELOR OF SCIENCE

Building Construction

Harry Raymond Askins, Jr. ------- Lake City
Charles Pershing Beam, Jr. -------- Gaffney
James Arthur Buck ----------------- Sumter
Leslie Keith Compton ---------- Myrtle Beach
Duane Larry Falls -------------- Clover
Asa Stuart Godbold --------------- Florence
Donald Raymond Heller --- Stroudsburg, Pa.
Kenard Michael Knust -- Sparrows Point, Md.
Earl O'Neil McCoy, Jr. ------------- Oswego
Robert Francis Moore ----------- Greenville
Vinroe Stephen Player -------------- Sumter
Waylon Brown Wilson, Jr. ------- Charleston

BACHELOR OF ARCHITECTURE

Norman Edward Bello -- Charleston Heights
Donald Edward Darden Balboa, Canal Zone
Han Choon Lee ------------ Beckley, W. Va
Paul Forrest Levine -------- Kensington, Md

COLLEGE OF EDUCATION

BACHELOR OF ARTS

Elementary Education

Judith Katherine Bell ------------ Piedmont
*Bessie Louise Durham ---------- Piedmont
*Linda Ann English ------------ LaFrance
***Martenza Lenoir Jones --------- Columbia
**Willie Chiles Martin ----------- Clemson
Brenda Stephens Miller ---------- Anderson
Elizabeth Wilson Nelson ----------- Taylors
Sarah Cornelia Powell ---- High Point, N. C.
Barbara Lynn Yost Rogers ---- Canton, N. C.
Sharon Frances Shirley ---------- Anderson
Mary Claudia Young ------------- Clemson

Secondary Education

**Elizabeth Fleming Balk --------- Blackville
Ronnie Terrill Blume ------------- Anderson
Grady Spence Burgner -- Chattanooga, Tenn.
*Mary Alice Marett Clayton --- Westminster
Larry Ray Crain ------------- Westminster
*Martha Elaine Hart -------------- Easley
***Nancy LaVerne Hill ----------- Piedmont
James Alexander Johns ------ Timonium, Md.
**Susan Elizabeth Klinck --------- Columbia
Gary Owen Leonard ----------- Charleston
*Victoria Anne Mattis ------------- Camden
Donald Edward Rochester ---------- Seneca
*Sally Ann Smith ---------------- Clemson
Tessa Leah Stewart ------------- Greenville
Richard Warren Thomas ------ Warren, Ohio
*Sara Gene Tripp -------------- Greenville

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

Dennis Nevitte Haltiwanger--Little Mountain
Ryan Tillman Jackson III ------ Decatur, Ga.
*John Allen Livingston ----------- Cross Hill
Charles Alexander Miller ------ Bennettsville
William Abner Nash ---------- Fountain Inn
George Milton Reed, Jr. ---------- Anderson
Don Carlos Sharp III ------------ Allendale
Perry Daniel Willis --------------- Roebuck

Industrial Education

Albert Wayne Abrams --------------- Cayce
James Robert Byrd --------------- Landrum
Heyward Douglas Elliott ----------- Camden
John Edward Charles Elliott, Jr. ---- Camden
Paul Francis Herbster, Jr. ---- Kearny, N. J.
Kenneth Herbert Jones ------------ Pickens
Robert Jeffrey Lake -------- Hicksville, N. Y.
Jeffrey Charles Pringle ----- Edgewater, Md.
Craig Gill Rice ------------ Baltimore, Md.
Richard Locke Sparks ---- Cave Spring, Ga.
*Walter Price Spires ---------- Clayton, Ala.
Michael Leon Tilley ------------- Anderson

Recreation and Park Administration

William Ross Ammons -------------- Lugoff
Gary John Arthur ----------- Baltimore, Md.
Joseph Wilton Bandy ---------- McCormick
Glenn Allen Bickett, Jr. ------------ Chester
James Gordon Collier III -------- Greenville
Robert Marion Craig, Jr. ---- Port St. Joe, Fla.
Wesley Davis Eidson ------ Kannapolis, N. C.
Johnny Michael Embler ---------- Townville
Bernard Charles Fagan
----------------- Cliffwood Beach, N. J.
Nicholas Purdy Gettys, Jr. ----------- Lugoff
*Richard Jehu Hanks -------------- Taylors
John Charles Hughes ------------ Hartsville
William McArthur Hughes ---------- Marion
Laval Hipp Johnson ------------- Newberry
Crawford Martin Keese -------- Westminster
Margaret Owings Lhotsky ------ Miami, Fla.
Kenneth Lane Lindsey ----------- Townville
Michael Lee Locklair ----------- Great Falls
Bruce Wayne Lowry -------- Eatontown, N. J.
Dexter Conrad Moore, Jr. -------- Blackstock
Henry Edwin Nichols ----------- Silverstreet
Warren Thomas Player -------------- Sumter
James LaBorde Prather, Jr. ------- Lexington
Robert Charles Price ---------------- Martin
Charles Lamar Roediger, Jr.
----------------- Winston-Salem, N. C.
John Dennis Scott ----------- Concord, N. C.
Larry Bruce Stancil ------------- Anderson
Francis Green Wilson -------------- Chester
Manley Storme Young III ---------- Fort Mill

Science Teaching

Charles August Lawyer ----- Camden, N. J.
Doris Ann Snow ------------- Simpsonville

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

Thomas Ernest Bell III	Orangeburg
George Edward Hand	San Antonio, Texas
John Frederick Long	Newberry
William Alfred McNeill	Abbeville
James Lloyd Wilson, Jr.	Chester

Ceramic Engineering

William Frederick Brandt	Easley
Joseph Allen Carroll	Chester
David Gadsden McClure	Anderson
George Stone Robinson	Lancaster
Thomas Lee Sinclair	Union
George Allen Southgate	West Palm Beach, Fla.

Chemical Engineering

James Wesley Bracken III	Rock Hill
Johnnie Earle Cockcroft	Moncks Corner
Donald Bawden Knudson, Jr.	Arlington, Va.

Civil Engineering

George Newman Allman, Jr.	Hampton, Va.
Scott Stilwell Askew	Miami, Fla.
*Thomas Osborn Barnwell, Jr.	Yonges Island
Kenneth Monroe Barrett	Rock Hill
Robert Preston Chaplin III	Ravenel
Samuel Frank Copeland	Bamberg
John Thomas Coxey	Spartanburg
Robert Martin Crisp	Asheville, N. C.
Arthur Bancroft deLaski III	Bay Village, Ohio
Louis DesChamps Eckley	Bishopville
James Ralph Freeland	Greenwood
Charles Robert Gatch	Beaufort
John William Glenn	Anderson
Joseph Banks Graham, Jr.	Chester
Don Richard McCombs	Greenville
Gary Lynn Pace	Easley
Richard Marion Pace	Greenville
James Russell III	Schenectady, N. Y.
Charles Lewis Shackelford, Jr.	Bethlehem, Pa.
Guy Elmore Slagle, Jr.	Garden City Beach
Donald Alexander Slate	Atlanta, Ga.
Richard Lide Stroman	Bowman
Virgil Garrett Svendsen	Charleston
William Ronald Terry	Greenville
*Reuben Sims Thomas	Carlisle
Robert Edward Thomson, Jr.	Aiken
Jerry Robert Timmons	Travelers Rest
James Roy Todd, Jr.	Matthews, N. C.
Peter Toussaint	Augusta, N. J.
Lawrence Earl Triplett	Cordova
Paul Coker Watson, Jr.	Columbia
David Earl Yount	Spartanburg

Electrical Engineering

Brunello Accomando	Inwood, N. Y.
Wayne Harris Atkinson	Greenville
Harry Carlisle Avinger, Jr.	Orangeburg
Ronnie Sheldon Benjamin	Liberty
William Joseph Byrum, Jr.	Anderson
*William Lawrence Calkins	Winnsboro
Jerry Lee Cox	Taylors
Fred Elms Culvern III	Columbia
Charles Donald Godsey	Greenwood
Talmadge Hardman Luker	Donalds
Harry Edwin Moose, Jr.	Newberry
Philip Cauthen Okey	Rock Hil
Robert Andrew Pace	Asheville, N. C
Mickey Earl Reeves	Lauren
James Harold Smith	Belto
Larry Wayne Taylor	Rock Hil
Charles Robert Tolley	Hot Springs, N. C
George Furman Williamson III	Cade

Industrial Engineering

Charles Alan Berkovich	Bethesda, Md.
James Ronald Cathey	Anderson
David Marshall O'Shields	Paulin

Mechanical Engineering

Louis Lee Abernethy -------- Charlotte, N. C.
David James Bell -------------------- Lodge
*Nigel Robert Brooks -------- Baltimore, Md.
Michael Lawrence Casey ---------- Clemson
Danny O'Brian Derrick ------------ Columbia
Thomas Fields Hash ----------- Easton, Md.
Harold William Johnson, Jr. -- Sullivans Island
Richard Manning Jones, Jr. ------ Greenville
James Patterson McAliley, Jr. ------ Rock Hill
John Charles Marquardt -- Riviera Beach, Fla.
Renaud Eugene Pelletier --------- Rock Hill
Terry Stephen Smith -------------- Pinopolis
Joseph Booker Whitehead -- Jacksonville, N. C.

Metallurgical Engineering

William Shaul Armstrong ------ Georgetown
John Yarborough Latimer ------- Bishopville
***William Greene Williams III --- Lancaster

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS

Arts and Sciences

Frank Herbert Arnold III -------- Charleston
Richard Hamilton Burgess ------ Athens, Ga.
Margaret Seales Chapin --- Jacksonville, Fla.
Jerry Dale Eskew ---------------- Greenville
Kenneth Edgar Hall -------------- Columbia
Hugh Valentine Harbort, Jr. ------- Columbia
Edward Jennings King ---------- Charleston
William Edward Martin ------ Umatilla, Fla.
Lawrence Lee Maxwell ---------- Greenville
William Elwood Mays -------------- Seneca
Raymond Thomas Peden -------- Piedmont
Harvey Thornton Smith, Jr. ---- Augusta, Ga.
Charles Hamilton Tennent ------ Spartanburg
Andrew Phillips Wise ------------ Greenville

BACHELOR OF SCIENCE

Industrial Management

Richard Jones Ashmore ---------- Greenville
*John Oliver Avinger ---------- Orangeburg
Terry Lee Bailey ------------------ Anderson
William Everett Batson ------------- Pickens
Charles Edwin Bolen ---------- Orangeburg
George Fox Bolen, Jr. ------------ Greenville
James Plummer Chick, Jr. -------- Rock Hill
John Lee Cline ---- Rutherford College, N. C.
Robert Martin Cochran --------------- Union
Thomas Francis Cook ------ Ft. Worth, Texas
Gary Felton Crooks --------------- Walhalla
Wayne Joseph Demcsak ---- Metuchen, N. J.
Samuel Pacy Dyer ---------- Baltimore, Md.
James Edward Floyd -------------- Conway
Michael Harry Fowler ----------- Charleston
Michael Wayne Fowler ---------- Charleston
Daniel Stephen Freeman ------------ Duncan
George Willard Gaillard ---------- Rock Hill
Albert von Kamp Gary, Jr. ---- Augusta, Ga.
John Melton Gault III ------------ Jonesville
William Harper Gilbert, Jr. ---- Atlanta, Ga.
James Arthur Gulledge III ----------- Sumter
Clyde Walton Hanes, Jr. --------- Holly Hill
Stephen Lee Hixson -------------- Hartsville
James Douglas Hood ------------ Greenville
Julius Clifford Hubbard III -------- Clemson
James Douglas Huff, Jr. ---------- Anderson
John Charles James ---------------- Sumter
Samuel Dickson Kennette ------------- Greer
Jac Edward Knust ----------- Baltimore, Md.
Joseph Michael Lhotsky, Jr. -- Baltimore, Md.
Marvin Edward McAbee, Jr. ---- Blacksburg
Clarence Edward McAlister, Jr. --- Anderson
Joe Franklin McHugh, Jr. ---------- Gaffney
Daniel Frederick Moore -- Upper St. Clair, Pa.
Rodney Locke Nelson --------- Lincoln, R. I.
Houston Addy Peden, Jr. -------- Greenville
Roland Lee Rayburn -------- Richmond, Va.
Charles Wallace Seigler ---------- Rock Hill
Robert James Semerjian -- Washington, D. C.
James Chester Simpson, Jr. ------- Varnville
Kenneth Everett Smith -------- Baltimore, Md.
Thomas Carlyle Smith --------- Atlanta, Ga.
Danny Howard Swanger ---------- Rock Hill
Robert Arthur Tedcastle II ----- Lantana, Fla.
William Echoles Thompson, Jr.
------------------------ North Augusta
George Daniel Walker ----- Somerville, N. J.
Wesley Franklin Walker --------- Rock Hill
John Marshall Wickham ---- Charlotte, N. C.
James Eugene Wiggins III -------- Greenville
Nelson Harrison Woods ------------ Beaufort

Textiles

Harry Benjamin Partlow, Jr. ------- Rock Hill
James Norman Williams, Jr. ------ Anderson

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS

Sandra Michelle Goodwin Anderson ----- West Monroe, La.
William Allen Behrens ----- Piedmont
*Diana Kay Bissey ----- Charleston
Richard Carnell Burgess ----- Lancaster
William Edwin Childress ----- Liberty
David George Dutt ----- York, Pa.
Peggy Joyce Gentle ----- Birmingham, Ala.
Dean Ardash Haledjian ----- Teaneck, N. J.
*Pelham Hancock ----- Easley
James Dalton Head III ----- Greenville
Gordon Louis Hesse ----- Lavallette, N. J.
*Barbara Rawley Hinkle ----- Mount Solon, Va.
Pope Duncan Johnson III ----- Newberry
Mark Evans Kelly ----- Montpelier, Vt.
Terence James Mulligan ----- Upper Montclair, N. J.
Fred Eugene Pearman, Jr. ----- Anderson
Gary Phillip Pulliam ----- Easley
Jere Louise Ragsdale ----- Easley
John Arthur Reagan III ----- Hartsville
Connie Joyce Robinson ----- Anderson
James Fenwick Shotton ----- Havertown, Pa.
**Joseph Francis Shumpert ----- Pelion
Durward Belmont Stinson, Jr. ----- Charleston
James Edward Tompkins ----- Lake Placid, Fla.
Ronald Rex Watson ----- Greenville
John Dane Weston ----- Union
Ann LaVerne Williams ----- Hodges
Peggy Lynn Wilson ----- Pendleton

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

Ashby Burgess Bodine II ----- Cheverly, Md.
Robert Marshall Dixon ----- Sumter
***Jane Watson Hass ----- Charleston
David James Parker ----- Camden
Tommy Gene Perkins ----- Greenwood

BACHELOR OF SCIENCE

Chemistry

David Anthony Colby ----- Richmond, Va.
*Taylor Bowman Jones ----- Florence
Alan Constantine Walter, Jr. ----- San Diego, Calif.

Geology

Louis Ligon Acker ----- Anderson

Mathematics

Eva Sue Edwards ----- Saluda
Clinton Roger Hinson ----- Columbia
Robert Erwin Liphard ----- Baltimore, Md.
Myrtle Janice Mull ----- Marietta

Medical Technology

*Frances Helen Bowen ----- Anderson

Pre-Medicine

Guery Alan Bowers ----- Union
***Michael James Faer ----- West Mifflin, Pa.
*James Roger Mahon ----- Gray Court
Dennis Arthur Moore ----- Stratford, Conn.
James Van Robertson ----- Fairburn, Ga.
Garland Delma Sentell ----- Norris

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*With honor
**With high honor
***With highest honor

MASTERS' DEGREES CONFERRED DECEMBER 18, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Agricultural Economics

Robert Alan Graham ------------ Gretna, La.
William Woodward Hall, Jr. ---------- York
William Phillip Hardee ------------ Conway

Animal Science

Don Avell Ballington -------------- Lexington

Dairy Science

Robert James Wordinger -- Philadelphia, Pa.

Entomology

Joseph Lane Kennedy ---------- Darien, Ga.

Forestry

Edward Jackson Cornwell --------- Rock Hill
Richard Camman Niederhof -------- Bonneau

Horticulture

James Theadore McClary, Jr. ------ Kingstree
Billy LeRoy Morris, Jr. ------------ Andrews

Microbiology

Katherine Fuller Kelly ----------- Newberry

Poultry Science

Don Wendell Creed ------ Laurinburg, N. C.
Charles Durham Humphrey -- Shannon, N. C.
Stanley Roger North -------- Demarest, N. J.
James Thomas Parker -- Elizabethtown, N. C.

Zoology

Nora Hull Featherston -------- Spartanburg
Charles Daniel Riddle ---------- Spartanburg

COLLEGE OF EDUCATION

MASTER OF EDUCATION

Karen Meredith LaFleur ------------ Clemson
Colon Terry Lane ---------------- Mountville

MASTER OF INDUSTRIAL EDUCATION

Benjamin Henry Phillips, Jr. ------ Newberry
John Orville Schleig, Jr. -- Long Branch, N. J.

COLLEGE OF ENGINEERING

MASTER OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

William Larry Vick ---------- Camden, Tenn.

Ceramic Engineering

Charles Richard Reese ---------------- Union
Warren Richard Walle
---------------- Monmouth Junction, N. J.

Chemical Engineering

Frederick Charles Ayer III ----------- Seneca
Irvin Atla Jefcoat ------------- Hampton, Va.
Joseph Edward Reilly ------------- Charleston
William Rodney Schofield ---------- Rock Hill

Electrical Engineering

Thomas Oscar Curlee III --------- Greenville
Donald Edward Gray ----------- Spartanburg

Engineering Mechanics

Kai-Chia Wang -------------- Taipei, Taiwan

Mechanical Engineering

Joseph William Culp -------------- Rock Hill
Nan-Sen Liao -------------- Hsinchu, Taiwan
Harrell Hudson Waldrop ---------- Greenville

Water Resources Engineering

Glenn Wayne Dukes ------------- Greenville

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF SCIENCE

Management

Wolf Dieter Bender ----------- LaUnion, Chile

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

English

William Alvin Shore ----------- Baldwin, Ga.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

MASTER OF SCIENCE

Chemistry

Clyde Preston Brown ------------- Charleston
Linda Carol Leonard Cowherd
-------------------------- LaFayette, Ga.
Richard Merle Rice ------ Kingsville, Texas
Richard George Schack ----- California, Ky.
Ann Edwards Womble --------- Augusta, Ga.

Mathematics

Patricia Thompson Brown ----------- Laurens
Julia Wood Tilley ------------- Atlanta, Ga.

Physics

Robert Emmett Flannery - - - Chicago, Ill.
William Alfred Lindstrom -- Wetumpka, Ala.

DOCTORS' DEGREES CONFERRED DECEMBER 18, 1969

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Agricultural Economics

William Charles Gillespie -- Newport News, Va.
B.S., Presbyterian College; M.S., Clemson University
Dissertation: An Econometric Analysis of the United States Shrimp Industry

Agronomy

James Howell Palmer -- Pendleton
B.S., Clemson University; M.S., University of Georgia
Dissertation: Estimates of Genetic Parameters in Hybrid Soft Red Winter Wheat Populations

Leslie Roger Reinhardt -- Bison, Kans.
B.S., Kansas State University
Dissertation: Weed Control and Environmental Factors Relating to the Activity of Chloroxuron and Selected Herbicides

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

John Irving Elsey -- Baytown, Texas
B.S., M.S., Clemson University
Dissertation: The Design of Optimal Control Systems for Multivariable Processes by Direct Search (Field of Specialization: Chemical Engineering)

Michael Robert Halberg -- Hibbing, Minn.
B.S., University of Minnesota; M.S., Iowa State University
Dissertation: Simulation of Oxygen Transport in the Brain by Monte Carlo Methods (Field of Specialization: Chemical Engineering)

Charles Lee Tsui --- Taipei, Taiwan
B.S., Taiwan University; M.S., University of Minnesota
Dissertation: An Analytical and Numerical Study of Circular Sandwich Plates Under Thermal and Mechanical Loads (Field of Specialization: Civil Engineering)

Charles David Veal --- Panama City, Fla.
B.Ag.E., M.S., University of Florida
Dissertation: Use of Radio Frequency Waves for Evaluation of Tomatoes (Field of Specialization: Agricultural Engineering)

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY

Engineering Management

Max Grey Holland -- Gastonia, N. C.
B.S., Clemson University; M.B.A., Georgia State College
Dissertation: An Efficient Allocation of General Hospital Facilities in Rural Areas: A Computer Algorithm Methodology

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

Clyde Edward Opliger ---------- Fredericksburg, Ohio
B.S., Kent State University; M.S., Emory University
Dissertation: Approaches to and a New Total Synthesis of Reduced d, l-Proaporphines and Related Compounds

Kenneth Bedros Takvorian ---------- Philadelphia, Pa.
B.S., Philadelphia College; M.S., Clemson University
Dissertation: Synthesis and Properties of Metal Chelates for Polymerization Studies

Chemical Physics

George Francis Adams ---------- Oakland, Calif.
B. S., Wabash College; M.S., Clemson University
Dissertation: Application of the Quantum Mechanical 3-Body Problem to the Study of Non-Linear, Triatomic Molecules

Mathematics

John Cleveland Perkins ---------- Valdese, N. C.
B.A., Wofford College; M.S., Clemson University
Dissertation: Symmetric and Involutory Matrices over Fields of Characteristic Two

Physics

Edward Thomas Hutcheson ---------- Purcellville, Va.
B.S., University of Richmond; M.S., Clemson University
Dissertation: The Effect of Applied Strain on the Electrical Resistance and Superconducting Transition Temperature of Thin Lead Films

Danny Ray Overcash ---------- China Grove, N. C.
B.A., Pfeiffer College
Dissertation: Fermi Surface Topology Changes in In Alloys Deduced from the Behavior of In Alloy Whiskers Under Strain

Michael William Riley ---------- Kingsville, Md.
B.S., Loyola College; M.S., Clemson University
Dissertation: Higher Order Elastic Constants in Metal Whiskers

DEGREES AWARDED IN 1968-69 BY MAJOR COURSES

ASSOCIATE DEGREES AWARDED IN 1968-69

SCHOOL OF NURSING		17
Nursing	17	
TOTAL ASSOCIATE DEGREES AWARDED IN 1968-69		17

BACHELORS' DEGREES AWARDED IN 1968-69

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES		116
Agricultural Economics	11	
Agronomy	10	
Animal Science	13	
Biology	48	
Dairy Science	2	
Food Science	4	
Forestry	15	
Horticulture	9	
Poultry Science	4	
SCHOOL OF ARCHITECTURE		54
Architecture	32	
Building Construction	16	
Pre-architecture	6	
COLLEGE OF ARTS AND SCIENCES *		177
Arts and Sciences	90	
Chemistry	7	
Geology	3	
Mathematics	19	
Medical Technology	2	
Physics	9	
Pre-medicine	47	
SCHOOL OF EDUCATION		185
Agricultural Education	18	
Elementary Education	28	
Industrial Education	33	
Recreation and Park Administration	50	
Science Teaching	14	
Secondary Education	42	
COLLEGE OF ENGINEERING		189
Agricultural Engineering	1	
Ceramic Engineering	16	
Chemical Engineering	31	
Civil Engineering	46	
Electrical Engineering	46	
Industrial Engineering	10	
Mechanical Engineering	36	
Metallurgical Engineering	3	
SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE		208
Economics	73	
Industrial Management	114	
Textile Chemistry	7	
Textile Management	1	
Textiles	13	
COLLEGE OF LIBERAL ARTS *		17
Arts and Sciences	17	

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* College of Arts and Sciences discontinued and College of Liberal Arts and College of Physical and Mathematical Sciences established July 1, 1969.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES *		16
Chemistry	4	
Geology	1	
Mathematics	6	
Physics	1	
Pre-medicine	4	
TOTAL BACHELORS' DEGREES AWARDED IN 1968-69		962

MASTERS' DEGREES AWARDED IN 1968-69

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES		28
Agricultural Economics	8	
Agronomy	1	
Animal Science	2	
Entomology	2	
Forestry	2	
Horticulture	3	
Plant Pathology	3	
Zoology	7	
SCHOOL OF ARCHITECTURE		1
Architecture	1	
COLLEGE OF ARTS AND SCIENCES *		19
Chemistry	1	
English	3	
History	1	
Mathematics	8	
Physics	6	
SCHOOL OF EDUCATION		47
Agricultural Education	1	
Education	39	
Industrial Education	7	
COLLEGE OF ENGINEERING		51
Bioengineering	1	
Ceramic Engineering	9	
Chemical Engineering	8	
Civil Engineering	9	
Electrical Engineering	7	
Engineering Mechanics	2	
Environmental Systems Engineering	8	
Mechanical Engineering	3	
Water Resources Engineering	4	
SCHOOL OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE		19
Economics	2	
Industrial Management	10	
Textile Chemistry	4	
Textile Science	2	
Textiles	1	
COLLEGE OF LIBERAL ARTS *		5
English	3	
History	2	
COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES *		4
Mathematics	3	
Physics	1	
TOTAL MASTERS' DEGREES AWARDED IN 1968-69		174

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* College of Arts and Sciences discontinued and College of Liberal Arts and College of Physical and Mathematical Sciences established July 1, 1969.

DOCTORS' DEGREES AWARDED IN 1968-69

College of Agricultural and Biological Sciences		5
Agricultural Economics	3	
Agronomy	1	
Entomology	1	
College of Arts and Sciences [*]		14
Chemistry	5	
Mathematics	3	
Physics	6	
College of Engineering		6
Bioengineering	1	
Chemical Engineering	1	
Electrical Engineering	1	
Engineering Mechanics	1	
Environmental Systems Engineering	1	
Mechanical Engineering	1	
School of Industrial Management and Textile Science		3
Engineering Management	3	
College of Physical and Mathematical Sciences [*]		5
Chemistry	2	
Mathematics	1	
Physics	2	
Total Doctors' Degrees Awarded in 1968-69		33
Total Number Degrees Awarded in 1968-69		1,186

TOTAL DEGREES AWARDED BY MAJOR COURSES, 1896-1969

Major Course	
Associate	
Nursing	69
Bachelors'	
Agriculture	244
Agriculture and Animal Industry	80
Agriculture and Chemistry	69
Agricultural Chemistry	102
Agricultural Economics	332
Agricultural Education	441
Agricultural Engineering	466
Agronomy	769
Animal Science	790
Applied Mathematics	34
Architectural Engineering	118
Architecture	615
Arts and Sciences	1,421
Bachelor of Science	3
Biology	170
Botany	12
Building Construction	30
Ceramic Engineering	219
Chemical-Engineering	402
Chemistry	391
Chemistry and Geology	11
Chemistry-Engineering	43
Civil Engineering	1,390
Dairy Science	393

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[*] College of Arts and Sciences discontinued and College of Liberal Arts and College of Physical and Mathematical Sciences established July 1, 1969.

Major Course	
Education	242
Electrical Engineering	1,770
Elementary Education	35
Engineering Industrial Education	70
Entomology	164
Food Science	10
Forestry	188
General Science	359
Geology	12
Horticulture	480
Industrial Education	376
Industrial Engineering	135
Industrial Management	1,035
Industrial Physics	56
Mathematics	91
Mechanical Engineering	1,517
Mechanical and Electrical Engineering	489
Medical Technology	12
Metallurgical Engineering	9
Physics	87
Poultry Science	46
Pre-architecture	8
Pre-medicine	469
Recreation and Park Administration	60
Secondary Education	58
Science Teaching	32
Soils	9
Textile Chemistry	328
Textile Engineering	1,060
Textile Industrial Education	85
Textile Management	306
Textile Manufacturing	1,045
Textile Science	36
Textiles	20
Veterinary Science	16
Vocational Agricultural Education	729
Weaving and Design	42

Double Majors

Agricultural Chemistry and Arts and Sciences	1
Agricultural Chemistry and General Science	1
Agricultural Economics and Animal Husbandry	1
Agricultural Economics and Vocational Agricultural Education	1
Agricultural Engineering and Civil Engineering	2
Agricultural Engineering and Electrical Engineering	1
Agricultural Engineering and Mechanical Engineering	1
Agronomy and Agricultural Education	1
Agronomy and Vocational Agricultural Education	4
Animal Husbandry and Industrial Management	1
Animal Husbandry and Vocational Agricultural Education	5
Animal Husbandry and Agricultural Education	3
Animal Husbandry and Ceramic Engineering	1
Animal Husbandry and Dairy	2
Architectural Engineering and Architecture, five-year	1
Architecture and Architectural Engineering	11
Architecture and Civil Engineering	1
Architecture, four-year, and Architecture, five-year	18
Architecture, four-year, and Mechanical Engineering	1
Arts and Sciences and Agricultural Economics	1
Chemical Engineering and Chemistry and Chemistry-Engineering	3
Chemical Engineering and Chemistry-Engineering	1

Major Course

Chemistry and Chemical Engineering	1
Chemistry and Chemistry-Engineering	1
Chemistry and General Science	1
Chemistry and Industrial Physics	1
Chemistry and Agricultural Chemistry	1
Civil Engineering and Architecture	1
Civil Engineering and Chemistry and Geology	2
Civil Engineering and Industrial Physics	1
Civil Engineering and Electrical Engineering	1
Civil Engineering and Mechanical Engineering	1
Electrical Engineering and Applied Mathematics	1
Electrical Engineering and Industrial Physics	1
Electrical Engineering and Mechanical Engineering	17
Electrical Engineering and Textile Engineering	1
Entomology and Architecture, five-year	1
Entomology and Pre-medicine	1
General Science and Ceramic Engineering	1
General Science and Education	1
General Science and Electrical Engineering	1
Horticulture and Agronomy	1
Horticulture and Architectural Engineering	1
Horticulture and Civil Engineering	1
Industrial Education and Architecture	1
Industrial Education and Electrical Engineering	1
Industrial Education and Forestry	1
Industrial Engineering and Mechanical Engineering	1
Mechanical Engineering and Textile Engineering	4
Poultry and Vocational Agricultural Education	1
Pre-medicine and Arts and Sciences	1
Pre-medicine and Textile Chemistry	2
Textile Chemistry and Civil Engineering	1
Textile Chemistry and Textile Manufacturing	1
Textile Engineering and Civil Engineering	1
Textile Engineering and Mechanical and Electrical Engineering	1
Textile Engineering and Textile Industrial Education	1
Textile Engineering and Textile Manufacturing	1
Textile Engineering and Weaving and Designing	1
Textile Manufacturing and Mechanical Engineering	1

MASTERS'

Agricultural Economics	77
Agricultural Education	82
Agricultural Engineering	36
Agronomy	27
Animal Science	23
Architecture	5
Bacteriology	6
Bioengineering	1
Botany	2
Ceramic Engineering	56
Chemical Engineering	41
Chemistry	85
Civil Engineering	43
Dairy Science	20
Economics	4
Education	198
Electrical Engineering	37
Engineering Mechanics	6
English	17
Entomology	59
Environmental Systems Engineering	20

Major Course	
Forestry	5
History	5
Horticulture	51
Industrial Education	34
Industrial Management	36
Mathematics	72
Mechanical Engineering	56
Microbiology	3
Nuclear Science	3
Nutrition	1
Physics	53
Plant Pathology	17
Plant Physiology	2
Poultry Science	9
Textile Chemistry	42
Textile Industrial Education	1
Textiles	1
Textile Science	2
Water Resources Engineering	21
Zoology	52
DOCTORS'	
Agricultural Economics	7
Agronomy	10
Animal Physiology	1
Bioengineering	2
Chemical Engineering	6
Chemical Physics	1
Chemistry	40
Civil Engineering	1
Electrical Engineering	3
Engineering Management	4
Engineering Mechanics	1
Entomology	18
Environmental Systems Engineering	1
Materials Engineering	2
Mathematics	7
Mechanical Engineering	4
Nutrition	2
Physics	19
Plant Pathology	6
Zoology	1
TOTAL DEGREES AWARDED 1896-1969	21,668

ENROLLMENT BY COUNTIES AND STATES
FIRST SEMESTER, 1969-70

County	*Total*
Abbeville	51
Aiken	129
Allendale	22
Anderson	414
Bamberg	31
Barnwell	44
Beaufort	20
Berkeley	40
Calhoun	15
Charleston	335
Cherokee	68
Chester	66
Chesterfield	37
Clarendon	25
Colleton	41
Darlington	83
Dillon	34
Dorchester	47
Edgefield	28
Fairfield	29
Florence	127
Georgetown	23
Greenville	747
Greenwood	128
Hampton	27
Horry	95
Jasper	15
Kershaw	54
Lancaster	53
Laurens	104
Lee	21
Lexington	88
Marion	28
Marlboro	27
McCormick	8
Newberry	71
Oconee	173
Orangeburg	127
Pickens	416
Richland	220
Saluda	24
Spartanburg	259
Sumter	145
Union	43
Williamsburg	40
York	177
SOUTH CAROLINA TOTAL	4,799

State or Country	*Total*
Alabama	27
Argentina	1
Arizona	1
Arkansas	5
Austria	1
California	10
Canada	4
Canal Zone	7
Chile	1
China	22
Colorado	3
Connecticut	47
Delaware	21
District of Columbia	10
Dominican Republic	1
Ecuador	1
England	2
Finland	1
Florida	139
France	1
Georgia	233
Germany	1
Greece	3
Guatemala	1
Hawaii	1
Holland	1
Hong Kong	6
Illinois	15
India	10
Indiana	10
Indonesia	1
Iowa	2
Israel	2
Japan	2
Kansas	2
Kentucky	15
Lebanon	1
Libya	1
Louisiana	15
Maine	4
Maryland	159
Massachusetts	32
Michigan	4
Minnesota	3
Mississippi	4
Missouri	2
Netherlands, W. I.	1
New Hampshire	3
New Jersey	254
New Mexico	2
New York	137
Nicaragua	1
North Carolina	244
North Dakota	1
Ohio	35
Oklahoma	4
Pakistan	1
Panama	4
Pennsylvania	112
Philippines	1
Puerto Rico	2
Rhode Island	5
South Carolina	4,799
Switzerland	1
Tennessee	63
Texas	9
Thailand	2
Turkey	3
Vermont	1
Virginia	131
Washington	2
West Virginia	12
Wisconsin	1
GRAND TOTAL	6,666

ENROLLMENT BY COUNTIES AND STATES
FIRST SEMESTER, 1969-70 (Greenville and Sumter Campuses)

County	*Greenville*	*Sumter*	*Total*
Abbeville	1		1
Anderson	1		1
Clarendon		16	16
Darlington		1	1
Florence		3	3
Georgetown		1	1
Greenville	113	1	114
Kershaw		14	14
Laurens	1		1
Lee		5	5
Marion		1	1
Newberry	1		1
Orangeburg		1	1
Pickens	6		6
Richland		1	1
Sumter		103	103
Williamsburg		1	1
TOTAL	123	148	
SO. CAROLINA TOTAL			271

State	*Greenville*	*Sumter*	*Total*
Florida	1		1
Georgia		1	1
New York	1		1
North Carolina		2	2
South Carolina	123	148	271
Tennessee		1	1
Texas	1		1
TOTAL	126	152	
GRAND TOTAL			278

NUMBER OF STUDENTS MAJORING IN EACH CURRICULUM, FIRST SEMESTER, 1969-70

CLASSIFICATION	Agriculture	Agric. Economics	Agronomy	Animal Science	Biology	Botany	Dairy Science	Entomology	Food Science	Forestry	Horticulture	Microbiology	Poultry Science	Pre-veterinary	Zoology	Architecture	Bldg. Construction	Pre-architecture	Agric. Education	Elem. Education	Industrial Education	Recrea. & Park Adm.	Science Teaching	Secondary Education	Agricultural Engr.	Ceramic Engr.	Chemical Engr.	Civil Engineering	Electrical Engr.	Engineering	Engr. Analysis	Industrial Engr.	Mechanical Engr.
Senior	...	19	14	12	19	2	10	4	4	29	15	2	3	1	38	83	33	7	21	27	32	95	17	55	12	16	44	83	66	...	...	5	69
Junior	...	23	12	12	13	3	3	...	3	22	12	5	4	14	40	3	30	49	28	37	50	75	13	72	6	12	39	65	64	...	...	...	65
Sophomore	...	25	9	9	23	3	3	3	8	16	12	1	2	21	28	...	15	47	21	65	56	68	12	75	10	11	43	74	99	1	...	...	44
Freshman	2	15	10	16	34	3	3	...	2	54	16	8	...	43	16	...	15	63	13	75	34	70	7	90	16	16	58	76	141	51	2	...	96
Postgraduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Graduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unclassified	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL	2	82	45	49	89	11	19	7	17	121	55	16	9	79	122	86	93	166	83	204	172	308	49	292	44	55	184	298	370	52	2	5	274

CLASSIFICATION	Metallurgical Engr.	Economics	Industrial Mgt.	Textile Chemistry	Textile Science	Textiles	Liberal Arts	English	French	German	History	Political Science	Psychology	Sociology	Spanish	Nursing (AA)	Nursing (BS)	Chemistry (BA)	Chemistry (BS)	Geology (BA)	Geology (BS)	Mathematics (BA)	Mathematics (BS)	Medical Technology	Physics (BA)	Physics (BS)	Pre-dentistry	Pre-medicine	Pre-pharmacy	Postgraduate	Graduate	Unclassified	Enrollment by Classes
Senior	5	66	155	3	...	16	...	33	6	1	32	14	24	22	4	...	...	4	9	1	10	3	30	1	...	5	15	43	...	...	...	...	1,339
Junior	4	92	137	2	1	6	...	42	5	1	45	32	25	24	1	...	1	1	18	...	8	7	24	9	...	11	18	53	3	...	...	...	1,344
Sophomore	1	91	91	4	1	8	22	36	6	2	47	50	39	18	...	21	6	...	10	...	4	4	38	8	...	7	24	69	8	...	...	...	1,419
Freshman	...	53	130	11	2	3	59	38	1	...	61	45	46	15	3	12	17	1	28	...	3	8	62	14	...	12	31	75	18	...	...	...	1,793
Postgraduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	...	...	21
Graduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	741	...	741
Unclassified	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	9
TOTAL	10	302	513	20	4	33	81	149	18	4	185	141	134	79	8	33	24	6	65	1	25	22	154	32	...	35	88	240	29	21	741	9	6,666

NUMBER OF STUDENTS MAJORING IN EACH CURRICULUM, FIRST SEMESTER, 1969-70 (Greenville Campus)

CLASSIFICATION	Biology	Forestry	Horticulture	Pre-veterinary	Bldg. Construction	Elem. Education	Recrea. & Parks Adm.	Science Teaching	Secondary Educa.	Chemical Engr.	Civil Engineering	Electrical Engr.	Engineering	Mechanical Engr.	Economics	Industrial Mgt.	Textile Science	Liberal Arts	English	History	Political Science	Psychology	Sociology	Nursing (AA)	Nursing (BS)	Chemistry (BS)	Mathematics (BS)	Medical Technology	Physics	Pre-dentistry	Pre-medicine	Pre-pharmacy	Enrollment by Classes
Senior	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1
Junior	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	1	...	3
Sophomore	...	...	...	...	...	1	...	1	1	...	...	...	...	1	4	1	...	1	1	...	...	...	1	...	...	2	...	...	...	...	2	...	16
Freshman	1	1	1	1	1	4	1	...	4	3	4	10	4	4	7	11	1	5	3	5	2	2	2	2	3	2	7	2	2	5	3	2	105
Postgraduate	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
TOTAL	2	1	1	1	1	5	1	1	5	3	4	10	4	5	11	12	1	7	5	5	2	2	3	2	3	4	7	3	2	5	6	2	126

NUMBER OF STUDENTS MAJORING IN EACH CURRICULUM, FIRST SEMESTER, 1969-70 (Sumter Campus)

CLASSIFICATION	Agric. Economics	Agronomy	Biology	Forestry	Horticulture	Pre-veterinary	Bldg. Construction	Pre-architecture	Elem. Education	Science Teaching	Secondary Educa.	Agricultural Engr.	Chemical Engr.	Civil Engineering	Electrical Engr.	Engineering	Industrial Engr.	Mechanical Engr.	Economics	Industrial Mgt.	Liberal Arts	English	History	Political Science	Psychology	Sociology	Nursing (AA)	Nursing (BS)	Chemistry (BS)	Mathematics (BS)	Pre-dentistry	Pre-medicine	Pre-pharmacy	Enrollment by Classes
Senior	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Junior	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	3
Sophomore	...	1	2	2	...	1	...	...	2	...	3	...	...	1	1	3	...	2	3	...	4	5	2	...	1	1	...	1	...	2	...	2	2	41
Freshman	1	...	3	6	1	...	1	1	8	1	2	2	2	3	6	2	2	...	10	8	14	5	3	2	2	2	1	2	2	7	3	3	1	106
Postgraduate	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
TOTAL	1	1	6	9	1	1	1	1	10	1	5	2	2	5	7	5	2	2	14	8	18	10	6	2	3	3	1	3	2	9	3	5	3	152

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CLEMSON
UNIVERSITY
RECORD

SPECIAL APPENDIX

ENROLLMENT BY COUNTIES AND STATES, 1969-70

County	*Total*
Abbeville	53
Aiken	133
Allendale	24
Anderson	461
Bamberg	33
Barnwell	46
Beaufort	21
Berkeley	42
Calhoun	15
Charleston	345
Cherokee	71
Chester	67
Chesterfield	38
Clarendon	28
Colleton	45
Darlington	87
Dillon	34
Dorchester	48
Edgefield	28
Fairfield	29
Florence	128
Georgetown	25
Greenville	779
Greenwood	131
Hampton	30
Horry	99
Jasper	15
Kershaw	56
Lancaster	53
Laurens	110
Lee	23
Lexington	91
Marion	28
Marlboro	30
McCormick	8
Newberry	73
Oconee	185
Orangeburg	130
Pickens	475
Richland	230
Saluda	26
Spartanburg	270
Sumter	158
Union	44
Williamsburg	41
York	182
SOUTH CAROLINA TOTAL	5,068

State or Country	*Total*
Alabama	30
Argentina	1
Arizona	1
Arkansas	6
Austria	1
California	12
Canada	5
Canal Zone	7
Chile	1
China	23
Colorado	3
Connecticut	47
Cyprus	1
Delaware	22
District of Columbia	10
Dominican Republic	1
Ecuador	1
England	2
Finland	1
Florida	149
France	1
Georgia	248
Germany	1
Greece	3
Guatemala	1
Hawaii	1
Holland	1
Hong Kong	7
Illinois	16
India	13
Indiana	11
Indonesia	1
Iowa	2
Israel	2
Japan	3
Kansas	2
Kentucky	15
Lebanon	2
Libya	1
Louisiana	19
Maine	4
Maryland	163
Massachusetts	33
Michigan	6
Minnesota	3
Mississippi	6
Missouri	2
Netherlands, W. I.	1
New Hampshire	3
New Jersey	262
New Mexico	2
New York	144
Nicaragua	1
North Carolina	244
North Dakota	2
Ohio	38
Oklahoma	6
Oregon	1
Pakistan	1
Panama	4
Pennsylvania	118
Philippines	1
Puerto Rico	2
Rhode Island	5
South Carolina	5,068
Switzerland	1
Tennessee	67
Texas	9
Thailand	2
Turkey	3
Vermont	1
Virginia	134
Washington	3
West Virginia	12
Wisconsin	1
Wyoming	1
GRAND TOTAL	7,028

ENROLLMENT BY COUNTIES AND STATES, 1969-70
(Greenville and Sumter Campuses)

County	*Greenville*	*Sumter*	*Total*
Abbeville	1		1
Anderson	1		1
Clarendon		16	16
Colleton	1		1
Darlington		1	1
Florence		3	3
Georgetown		1	1
Greenville	158	1	159
Kershaw		15	15
Laurens	1		1
Lee		5	5
Marion		1	1
Newberry	1		1
Orangeburg		1	1
Pickens	6		6
Richland		2	2
Spartanburg	2	1	3
Sumter		124	124
Williamsburg		1	1
TOTAL	171	172	
SO. CAROLINA TOTAL			343

State or County	*Greenville*	*Sumter*	*Total*
Florida	1		1
Georgia	1	1	2
Jordan	1		1
Kansas	1		1
New York	1		1
North Carolina	1	2	3
Pennsylvania		1	1
South Carolina	171	172	343
Tennessee		1	1
Texas	1		1
Wisconsin	1		1
TOTAL	179	177	
GRAND TOTAL			356

NUMBER OF STUDENTS MAJORING IN EACH CURRICULUM, 1969-70

CLASSIFICATION	Agriculture	Agric. Economics	Agronomy	Animal Industries	Animal Science	Biology	Botany	Dairy Science	Entomology	Food Science	Forestry	Horticulture	Microbiology	Poultry Science	Pre-veterinary	Zoology	Architecture	Bldg. Construction	Pre-architecture	Agricultural Educa.	Elementary Educa.	Industrial Education	Recrea. & Park Adm.	Science Teaching	Secondary Educa.	Agricultural Engr.	Ceramic Engr.	Chemical Engr.	Civil Engineering	Electrical Engr.	Engineering	Engr. Analysis	Industrial Engr.	Mechanical Engr.
Senior	...	20	14	...	13	19	2	10	4	4	32	15	2	3	1	38	83	33	8	23	29	33	98	17	56	12	16	44	87	67	...	...	5	69
Junior	...	24	12	...	15	14	3	3	...	3	22	12	5	4	14	40	3	30	49	28	41	51	79	13	74	6	12	39	65	65	...	...	...	68
Sophomore	...	25	9	1	10	23	3	3	3	8	18	14	1	2	22	28	...	17	49	23	71	58	71	12	78	11	11	45	78	105	1	...	...	47
Freshman	2	15	10	1	16	35	3	3	...	2	55	16	8	...	45	16	...	18	65	14	82	36	74	8	97	17	17	58	80	145	52	2	...	100
Postgraduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Graduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unclassified	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL	2	84	45	2	54	91	11	19	7	17	127	57	16	9	82	122	86	98	171	88	223	178	322	50	305	46	56	186	310	382	53	2	5	284

CLASSIFICATION	Metallurgical Engr.	Accounting	Economics	Industrial Mgt.	Textile Chemistry	Textile Science	Textiles	Liberal Arts	English	French	German	History	Political Science	Psychology	Sociology	Spanish	Nursing (AA)	Nursing (BS)	Chemistry (BA)	Chemistry (BS)	Geology (BA)	Geology (BS)	Mathematics (BA)	Mathematics (BS)	Medical Technology	Physics (BA)	Physics (BS)	Pre-dentistry	Pre-medicine	Pre-pharmacy	Postgraduate	Graduate	Unclassified	Enrollment by Classes
Senior	5	...	69	160	3	...	16	...	33	6	1	33	14	24	22	4	...	...	5	10	1	10	3	30	1	...	5	15	44	...	...	...	...	1,371
Junior	4	...	93	146	2	1	6	...	46	5	1	46	33	27	24	1	...	1	1	18	...	8	7	24	9	...	11	18	55	3	...	...	...	1,384
Sophomore	1	1	96	96	4	1	8	23	39	7	2	52	51	42	20	...	21	7	1	10	...	4	6	39	9	...	7	25	70	9	...	...	...	1,498
Freshman	...	...	57	134	11	2	3	60	39	1	...	64	45	48	16	3	13	17	1	29	...	3	9	65	14	1	12	31	77	19	...	...	...	1,866
Postgraduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23	...	...	23
Graduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	847	...	847
Unclassified	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	39	39
TOTAL	10	1	315	536	20	4	33	83	157	19	4	195	143	141	82	8	34	25	8	67	1	25	25	158	33	1	35	89	246	31	23	847	39	7,028

NUMBER OF STUDENTS MAJORING IN EACH CURRICULUM, 1969-70 (Greenville Campus)

CLASSIFICATION	Biology	Forestry	Horticulture	Pre-veterinary	Bldg. Construction	Pre-architecture	Elementary Educa.	Industrial Educa.	Recrea. & Park Adm.	Science Teaching	Secondary Educa.	Ceramic Engr.	Chemical Engr.	Civil Engineering	Electrical Engr.	Engineering	Engr. Analysis	Mechanical Engr.	Accounting	Economics	Industrial Mgt.	Textiles	Textile Science	Liberal Arts	English	History	Political Science	Psychology	Sociology	Nursing (AA)	Nursing (BS)	Chemistry (BS)	Mathematics (BS)	Medical Technology	Physics	Pre-dentistry	Pre-medicine	Pre-pharmacy	Postgraduate	Unclassified	Enrollment by Classes
Senior	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	1	. .	. .		. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	1	. .	. .	. .	. .	. .	. .	2
Junior	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	. .	. .	1	1	1	. .	1	1	. .	. .	. .	. .	. .	. .	. .		. .	. .	. .	1	. .	. .	. .	6
Sophomore	. .	. .	. .	. .	1	. .	3	. .	. .	1	1	. .	. .	. .		. .	. .	2	. .	4	1	. .	. .	1	1	. .	. .	. .	1	. .	. .	2	. .	. .	. .	. .	2	. .	. .	. .	20
Freshman	1	1	1	1	1	1	5	1	1	. .	4	. .	4	5	11	6	1	5	2	8	14	. .	1	8	4	7	2	3	3	3	6	3	8	2	2	5	4	2	. .	. .	136
Postgraduate	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	3	. .	3
Unclassified	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	11	11
TOTAL	1	1	1	1	2	1	8	1	1	1	5	1	4	5	11	6	1	7	2	13	16	1	1	10	6	7	2	3	4	3	6	5	8	3	2	5	7	2	3	11	178

NUMBER OF STUDENTS MAJORING IN EACH CURRICULUM, 1969-70 (Sumter Campus)

CLASSIFICATION	Agric. Economics	Agronomy	Biology	Forestry	Horticulture	Pre-veterinary	Bldg. Construction	Pre-architecture	Elementary Educa.	Industrial Educa.	Science Teaching	Secondary Educa.	Agricultural Engr.	Chemical Engr.	Civil Engineering	Electrical Engr.	Engineering	Industrial Engr.	Mechanical Engr.	Economics	Industrial Mgt.	Liberal Arts	English	History	Political Science	Psychology	Sociology	Nursing (AA)	Nursing (BS)	Chemistry (BS)	Mathematics (BS)	Pre-dentistry	Pre-medicine	Pre-pharmacy	Postgraduate	Enrollment by Classes
Senior	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Junior	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	3
Sophomore	...	1	2	2	...	1	...	...	2	...	...	4	...	...	1	1	3	...	2	3	...	4	5	2	...	1	1	...	1	...	2	...	2	2	...	42
Freshman	2	...	5	6	1	...	1	1	12	1	1	5	2	2	4	6	3	4	...	10	8	16	5	4	2	4	2	1	2	3	7	3	3	2	...	128
Postgraduate	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
TOTAL	2	1	8	8	1	1	1	1	14	1	1	9	2	2	6	7	6	4	2	14	8	20	10	7	2	5	3	1	3	3	9	3	5	4	2	176

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ANNOUNCEMENTS
1971-1972

RECORD
1970-1971

CLEMSON, SOUTH CAROLINA

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This general university catalog contains information of particular interest to prospective students and to undergraduates. Students interested in graduate work should request the Graduate School Bulletin from the Dean of Graduate Studies and University Research.

The information section on pages 50-102 contains information about admission requirements, expenses, buildings and grounds, housing facilities and ROTC. Educational benefits for veterans and current Selective Service regulations may be found on page 55.

The forty-seven curriculums of the University are listed on page 127 and the Colleges, Schools, and their major courses are described in detail beginning on the following pages: Agriculture and Biological Sciences, page 128; Architecture, page 149; Education, page 154; Engineering, page 175; Forest and Recreation Resources, page 190; Industrial Management and Textile Science, page 192; Liberal Arts, page 202; Nursing, page 210; Physical and Mathematical Sciences, page 212.

The courses of the University are listed alphabetically in the Description of Courses section beginning on page 230.

For information on admissions, entrance and placement examinations, and transfer credits write the Office of Admissions and Registration. For information on family housing on the campus, write the Associate Director of Housing.

Clemson University offers equal educational opportunity to all persons without regard to race, creed, color or national origin.

This policy applies in all matters, including:

1. Admission and education of students.
2. Availability of student loans, grants, scholarships and job opportunities.
3. Employment and promotion of teaching and non-teaching personnel.
4. Student and faculty housing situated on premises owned or occupied by the University.
5. Off-campus housing not owned by the University but listed with the University for referral purposes.
6. Activities conducted on premises owned or occupied by the University.

New Series, Vol. XLVI, April, 1971 No. 2

CLEMSON
UNIVERSITY

RECORD

SEVENTY-EIGHTH YEAR

CATALOG NUMBER

1970-71

PRELIMINARY ANNOUNCEMENTS, 1971-72

Published quarterly by Clemson University, Clemson, South Carolina
Second-class postage paid at Clemson, South Carolina

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1970/71

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ARCHITECTURE ■

EDUCATION ■

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INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE ■

LIBERAL ARTS ■

NURSING ■

PHYSICAL AND MATHEMATICAL SCIENCES ■

DESCRIPTION OF COURSES ■

PUBLIC SERVICE ACTIVITIES ■

317187

UNIVERSITY CALENDAR

SUMMER SESSIONS 1970

First Session

(Classes meet Monday-Friday)

May 18	Registration
May 19	Classes begin
June 24, 25	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 29	Orientation, new students
June 30	Registration
July 1	Classes begin
August 1	Classes meet
August 5, 6	Examinations
August 8	Graduation

SESSION 1970-71

First Semester

August 17, 18	Orientation, new students
August 19	Registration, all students
August 20	Late registration
August 21	Late registration fee applies
August 21	Classes begin, regular schedule
August 27	Last day for registration
September 3	Last day to add a subject
September 3	Last day to order diploma for mid-year graduation
September 17	Last day to drop a subject without record of drop
October 12	Preliminary reports due
November 11	Last day to withdraw without having grades recorded
November 11	Last day to drop a subject
November 25	Thanksgiving holidays begin after last class
November 30	Classes resume
December 7	Examinations begin
December 17	Mid-year graduation

Second Semester

January 4	Orientation, new students
January 5	Registration, all students
January 6	Late registration
January 7	Late registration fee applies
January 7	Classes begin, regular schedule
January 13	Last day for registration
January 20	Last day to add a subject
January 20	Last day to order diploma for May graduation
February 3	Last day to drop a subject without record of drop
March 1	Preliminary reports due

March 12	Spring holidays begin after last class
March 22	Classes resume
April 2	Last day to withdraw without having grades recorded
April 2	Last day to drop a subject
April 7	Honors and Awards Day—classes suspended at 12 noon
April 26	Examinations begin
May 7	Commencement

SUMMER SESSIONS 1971

First Session

(Classes meet Monday-Friday)

May 17	Registration
May 18	Classes begin
June 23, 24	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 28	Orientation, new students
June 29	Registration
June 30	Classes begin
July 31	Classes meet
August 4, 5	Examinations
August 7	Graduation

SESSION 1971-72

First Semester

August 16, 17	Orientation, new students
August 18	Registration, all students
August 19	Late registration
August 20	Late registration fee applies
August 20	Classes begin, regular schedule
August 26	Last day for registration
August 26	Last day to add a subject
September 2	Last day to order diploma for mid-year graduation
September 16	Last day to drop a subject without record of drop
October 11	Preliminary reports due
November 10	Last day to withdraw without having grades recorded
November 10	Last day to drop a subject
November 24	Thanksgiving holidays begin after last class
November 29	Classes resume
December 6	Examinations begin
December 16	Mid-year graduation

Second Semester

January 3	Orientation, new students
January 4	Registration, all students
January 5	Late registration
January 6	Late registration fee applies
January 6	Classes begin, regular schedule

January 12	Last day for registration
January 12	Last day to add a subject
January 19	Last day to order diploma for May graduation
February 2	Last day to drop a subject without record of drop
February 28	Preliminary reports due
March 10	Spring holidays begin after last class
March 20	Classes resume
March 31	Last day to withdraw without having grades recorded
March 31	Last day to drop a subject
April 5	Honors and Awards Day—classes suspended at 12 noon
April 24	Examinations begin
May 5	Commencement

SUMMER SESSION 1972

First Session

(Classes meet Monday-Friday)

May 15	Registration
May 16	Classes begin
June 21, 22	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 26	Orientation, new students
June 27	Registration
June 28	Classes begin
July 29	Classes meet
August 2, 3	Examinations
August 5	Graduation

PART I

PERSONNEL

PART I—Personnel

BOARD OF TRUSTEES

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Winchester Smith	Williston
Robert R. Coker	Hartsville
James C. Self	Greenwood
Frank J. Jervey	Clemson
Patrick N. Calhoun	Charlotte, N. C.

TERM EXPIRES 1972

Paul Quattlebaum, Jr.	Charleston
W. Gordon McCabe, Jr.	Greenville
T. Kenneth Cribb	Spartanburg

TERM EXPIRES 1974

A. M. Quattlebaum	Florence
L. D. Holmes	Johnston
E. Oswald Lightsey	Hampton

A. W. Rigsby, *Secretary*	Clemson

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1970

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C. O. Browning	Greenwood
John T. E. Cribb	Spartanburg
Charles K. Cross	Columbia
William N. Geiger	Columbia
John M. Hamrick	Gaffney
W. Norris Lightsey	Varnville
Ellison S. McKissick, Jr.	Easley
Louis W. Moelchert, Jr.	Florence
Philip H. Prince	Spartanburg
Salvador V. Sottile	Isle of Palms
Henry W. Webb	Hartsville
Harry E. Wilkinson, Jr.	Sumter

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Victor Hurst, Ph.D.	*Vice President for Academic Affairs and Dean of the University*
Melford A. Wilson, B.S. in Commerce	*Vice President for Business and Finance and Comptroller*
Stanley Gosanko Nicholas, B.S. in M.E.	*Vice President for Development*
Allen Wood Rigsby, M.A., J.D.	*Vice President for Executive Affairs and University Counsel*
Walter Thompson Cox, B.S.	*Vice President for Student Affairs and Dean of Students*

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Allen Wood Rigsby, M.A., J.D.	*Vice President for Executive Affairs and University Counsel*
Dorothy L. Abbott, A.B.	*Secretary to the President*

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Claud Bethune Green, Ph.D.	*Dean of Undergraduate Studies*
Arnold Edward Schwartz, Ph.D.	*Dean of Graduate Studies and University Research*
Samuel Marsh Willis, Ph.D.	*Dean of University Extension*

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES [*]

William Henry Wiley, Ph.D.	*Dean, College of Agriculture and Biological Sciences*
Olen Branford Garrison, Ph.D.	*Director of Agricultural Experiment Station, Director of Research in Agriculture*
Rufus Kent Guthrie, Ph.D.	*Director of Division of Biology*
James Edwin Halpin, Ph.D.	*Associate Director of Agricultural Experiment Station*
Jess Willard Jones, Ph.D.	*Director of Resident Instruction and Assistant to the Dean*
William Joseph Lanham, Ph.D.	*Head, Department of Agricultural Economics and Rural Sociology*
Lowery Heywood Davis, Ph.D.	*Head, Department of Agricultural Education*[†]
Absalom West Snell, Ph.D.	*Head, Department of Agricultural Engineering*[‡]
Ulysses Simpson Jones, Ph.D.	*Head, Department of Agronomy and Soils*
Richard Ferman Wheeler, Ph.D.	*Head, Department of Animal Science*
William Monroe Epps, Ph.D.	*Head, Department of Plant Pathology and Physiology*
Willis Alonzo King, Ph.D.	*Head, Department of Dairy Science*
Sidney Brooks Hays, Ph.D.	*Head, Department of Entomology and Economic Zoology*
Woodie Prentiss Williams, Ph.D.	*Head, Department of Food Science*
Taze Leonard Senn, Ph.D.	*Head, Department of Horticulture*
Bobby Dale Barnett, Ph.D.	*Head, Department of Poultry Science*

COLLEGE OF ARCHITECTURE

Harlan Ewart McClure, M.Arch., F.A.I.A.	*Dean, College of Architecture*
Robert Howard Hunter, M.F.A.	*Head, Department of Visual Studies*

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[*] See also College of Agriculture and Biological Sciences Staff, including Public Service Activities, on page 405.

[†] Agricultural Education curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.

[‡] Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

COLLEGE OF EDUCATION

Harold Fochone Landrith, Ed.D. . . . . *Dean, College of Education*

Elmer Newton Tyndall, M.B.A., Colonel, United States Air Force—
Head, Department of Aerospace Studies

Lowery Heywood Davis, Ph.D., *Head, Department of Agricultural Education*†

Morris Audrey King, Ed.D. . . . . *Head, Department of Elementary and Secondary Education*

Alfred Franklin Newton, Ed.D., *Head, Department of Industrial Education*

George Kameil Maertens, B.S., Colonel, United States Army—
Head, Department of Military Science

Myrton Alfred Packer, Ed.D. . . . *Coordinator, Office of Educational Services*

John Hasford Rodgers, Ph.D. . . . . *Director, Research Coordinating Unit*

Arthur Kenneth Jensen, Ph.D. . . . . *Director, Vocational Education Media Center*

COLLEGE OF ENGINEERING

Linvil Gene Rich, Ph.D. *Dean, College of Engineering*

Lyle Chester Wilcox, Ph.D. . . . . *Associate Dean for Professional Studies*

Samuel F. Hulbert, Ph.D. . . . . *Associate Dean for Engineering Research and Interdisciplinary Programs*

James Leon Edwards, M.S. . . . *Assistant to the Dean, College of Engineering*

Robert Allen Banister, M.S. . . . . *Director of Continuing Education*

Absalom West Snell, Ph.D., *Head, Department of Agricultural Engineering**

Gilbert Chase Robinson, B.Cer.E., Sc.D. . . . . *Head, Department of Ceramic Engineering*

Charles Edward Littlejohn, Ph.D. . . . . *Head, Department of Chemical Engineering*

Herbert William Busching, Ph.D. . . *Head, Department of Civil Engineering*

Lyle Chester Wilcox, Ph.D. . . . . *Acting Head, Department of Electrical and Computer Engineering*

Robert Wardlaw Moorman, Ph.D. . . . . . . *Head, Department of Engineering Mechanics*

Everett Laitala, M.E. . . . . *Head, Department of Engineering Services*

John F. Andrews, Ph.D. . . . . . . *Head, Department of Environmental Systems Engineering*

James Leon Edwards, M.S. . . . . *Acting Head, Department of Mechanical Engineering*

Samuel F. Hulbert, Ph.D., *Acting Head, Division of Interdisciplinary Studies*

COLLEGE OF FOREST AND RECREATION RESOURCES

William Henry Davis McGregor, Ph.D. . . . . *Dean, College of Forest and Recreation Resources*

Herbert Brantley, Ph.D. . . . . *Associate Dean, College of Forest and Recreation Resources; Head, Department of Recreation and Park Administration*

Robert Max Allen, Ph.D. . . . . *Head, Department of Forestry*

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

Wallace Dabney Trevillian, Ph.D. . . . . *Dean, College of Industrial Management and Textile Science*

Thomas Daniel Efland, M.S. . . . . *Associate Dean, Director of Research*

Francis Alan Close, Ph.D. . . . . *Head, Department of Economics*

Clinton Howard Whitehurst, Jr., Ph.D. . . . . *Head, Department of Industrial Management*

John Lauren Lundberg, Ph.D. . . . . *Head, Department of Textiles*

William C. Laffoday, M.S. . . . . *Director, Professional Development*

Harold Betts Wilson, B.S. . . . . *Field Representative*

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† Agricultural Education curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.

* Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

COLLEGE OF LIBERAL ARTS

Headley Morris Cox, Ph.D.	*Dean, College of Liberal Arts*
Marvin Alpheus Owings, Ph.D.	*Head, Department of English*
John Harrison Butler, Ed.D.	*Head, Department of Music*
Robert Stansbury Lambert, Ph.D.	*Head, Department of Social Sciences*

SCHOOL OF NURSING

Geraldine Labecki, Ed.D.	*Dean, School of Nursing*
Leon Roswal, M.A.	*Director, Associate Degree Program*

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

Clayton Verl Aucoin, Ph.D.	*Dean, College of Physical and Mathematical Sciences*
Harold Garth Spencer, Ph.D.	*Head, Department of Chemistry and Geology*
John Willis Kenelly, Ph.D.	*Head, Department of Mathematics*
Henry Elliott Vogel, Ph.D.	*Head, Department of Physics*

GRADUATE SCHOOL AND UNIVERSITY RESEARCH

Arnold Edward Schwartz, Ph.D.	*Dean of Graduate Studies and University Research*
Robert Walter Henningson, Ph.D.	*Assistant Dean of University Research*

DIRECTOR OF THE LIBRARY

John Wallace Gordon Gourlay, A.M.L.S.	*Director of the Library*

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TEACHING AND RESEARCH FACULTIES

ROBERT COOK EDWARDS

President

B.S., Clemson University; LL.D., The Citadel; LL.D., Wofford College

VICTOR HURST

Vice President for Academic Affairs and Dean of the University

Professor of Dairy Science

B.S., 1938, M.S., 1940, Rutgers University; Ph.D., University of Missouri, 1948

MAIN CAMPUS

Abernathy, Atwell Ray, *Associate Professor of Environmental Systems Engineering.*
A.B., Lenoir-Rhyne College, 1953; M.S.P.H., 1959, Ph.D., 1963, University of North Carolina.

Acker, Kenneth Dixon, *Part-Time Visiting Lecturer in Iudustrial Management.*
A.B., Presbyterian College, 1963; J.D., University of South Carolina, 1966.

Acorn, John Thomson, *Associate Professor of Architecture.*
B.A., Montclair State College, 1959; M.F.A., Cranbrook Academy of Art, 1961.

Adams, Hewitt Dayne, *Assistant Professor of History.*
B.S., United States Naval Academy, 1937; M.A., Claremont Graduate School, 1964.

Adams, Mary Smith, *Instructor in English.*
B.A., 1969, MA., 1970, Washington State University.

Adkins, Theodore Roosevelt, Jr., *Professor of Entomology and Economic Zoology.*
B.S., 1952, M.S., 1954, Ph.D., 1958, Auburn University.

Aiem, Irène Armande, *Visiting Instructor in French.*
Licence es Lettres, The Sorbonne, 1968.

Alam, Kursheed, *Associate Professor of Mathematics.*
B.S., 1941, M.S., 1943, Patna Science College; Ph.D., University of Minnesota, 1963.

Albert, Harold Edward, *Assistant Professor of Political Science.*
B.S., Madison College, 1957; B.D., United Theological Seminary, 1960; M.A.T., Miami University (Ohio), 1960.

Allen, Joe Frank, *Associate Professor of Chemistry.*
A.B., Berry College, 1955; M.S., University of Mississippi, 1959; Ph.D., Georgia Institute of Technology, 1963.

Allen, Robert Max, *Head of Forestry Department; Professor of Forestry.*
B.S., 1947, M.S., 1951, Iowa State University; Ph.D., Duke University, 1958.

Alley, Forrest Christopher, *Professor of Chemical Engineering.*
B.S., 1951, M.S., 1956, Auburn University; Ph.D., University of North Carolina, 1962; P. E.

Alphin, John Gilbert, *Associate Professor of Agricultural Engineering.*
B.S., 1960, M.S., 1962, Ph.D., 1965, North Carolina State University.

Amoss, Donald Curtis, *Assistant Professor of Electrical and Computer Engineering.*
B.S., 1964, M.S., 1966, Ph.D., 1968, Drexel Institute of Technology.

Anderson, Grant William, *Associate Professor of Zoology.*
B.S., D.V.M., Iowa State University, 1932; M.S., Virginia Polytechnic Institute, 1934.

Andrews, John F., *Head of Department of Environmental Systems Engineering; Professor of Environmental Systems Engineering.*
B.S.C.E., 1951, M.S., 1953, University of Arkansas; Ph.D., University of California, 1964; P. E.

Arbena, Joseph Luther, *Assistant Professor of History.*
A.B., George Washington University, 1961; Ph.D., University of Virginia, 1970.

Arnold, Edwin Pratte, *Instructor in German.*
A.B., University of South Carolina, 1958; M.A., Kent State University, 1968.

Arrington, Ottie Ward, *Instructor in English.*
B.A., Winthrop College, 1934; M.S., Clemson University, 1961.

Ashworth, Ralph Page, *Professor of Botany.*
B.S., Wake Forest University, 1939; M.A., 1945, Ph.D., 1960, University of North Carolina.

Aucoin, Claire Russell, *Assistant Professor of Mathematics.*
A.B., Shorter College, 1951; M.S., Auburn University, 1954.

Aucoin, Clayton Verl, *Dean, College of Physical and Mathematical Sciences and Professor of Mathematics.*
B.A., Louisiana College, 1951; M.S., 1953, Ph.D., 1956, Auburn University; Post Doctorate, Stanford University, 1960-61.

Austin, John Henry, *Professor of Environmental Systems Engineering.*
B.C.E., Syracuse University, 1951; S.M., Massachusetts Institute of Technology, 1953; Ph.D., University of California, 1963; P. E.

Bachop, William Earl, *Assistant Professor of Zoology.*
A.B., Western Reserve University, 1950; M.S., 1958, Ph.D., 1963, Ohio State University; Post Doctorate, University of Washington, 1965-69.

Bacon, John Roger, *Assistant Professor of Chemistry.*
B.S., Kansas State University, 1964; M.S., 1967, Ph.D., 1968, University of Iowa.

Bailey, Roy Horton, Jr., *Assistant Professor of Chemistry.*
B.S., 1948, Ph.D., 1958, University of North Carolina.

Ball, Walter Lee, *Associate Professor of Electrical and Computer Engineering.*
B.E.E., 1949, M.E.E., 1955, Clemson University; P. E.

Banister, Robert Allen, *Associate Professor, Director of Continuing Education, College of Engineering.*
B.S., Clemson University, 1939; M.S., Bradley University, 1949.

Barfield, Rayford Elliott, Jr., *Assistant Professor of English.*
A.B., LaGrange College, 1961; M.A., University of Georgia, 1963; Ph.D., University of Tennessee, 1969.

Barker, Robert H., *Associate Professor of Textiles and Chemistry.*
B.S., Clemson University, 1959; Ph.D., University of North Carolina, 1963.

Barlage, William Berdell, Jr., *Associate Professor of Chemical Engineering.*
B.S., Lehigh University, 1954; M.Ch.E., University of Virginia, 1955; Ph.D., North Carolina State University, 1960.

Barnes, William Carroll, *Professor of Horticulture, Truck Experiment Station.*
B.S., Clemson University, 1931; Ph.D., Cornell University, 1935.

Barnett, Bobby Dale, *Head of Poultry Science Department; Professor of Poultry Science.*
B.S., 1950, M.S., 1954, University of Arkansas; Ph.D., University of Wisconsin, 1957.

Barnett, Ortus Webb, *Assistant Professor of Plant Pathology and Physiology.*
B.S.A., 1961, M.S., 1965, University of Arkansas; Ph.D., University of Wisconsin, 1968; Post Doctorate, Scottish Horticultural Institute, 1968-69.

Barnhill, James Wallace,* *Assistant Professor of History.*
B.A., Presbyterian College, 1947; M.A., Northwestern University, 1949.

Baron, William, *Associate Professor of Civil Engineering.*
B.S.C.E., The College of the City of New York, 1960; M.S.C.E., 1963, Ph.D., 1966, Purdue University; P. E.

Barron, Rhelda W., *Assistant Professor of Accounting.*
B.S., 1967. M.B.A., 1968, Mississippi State University.

Barth, Clyde Lewis, *Associate Professor of Agricultural Engineering.*
B.S., University of Illinois, 1955; M.S., University of Wisconsin, 1961.

Bartmess, Eugenie Ventre,* *Instructor in Mathematics.*
B.S., 1945, M.S., 1949, Louisiana State University.

Barton, Robert Freers, *Instructor in Speech.*
B.A., Western Michigan University, 1967; M.A., Bowling Green State University, 1968.

Bauknight, Lehman M., Jr., *Professor of Agricultural Economics and Rural Sociology.*
B.S., 1935, M.S., 1949, Clemson University.

Bauld, Nelson Robert, Jr., *Professor of Engineering Mechanics.*
B.S.M.E., 1958, M.S., 1960, West Virginia University; Ph.D., University of Illinois, 1963; P. E.

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* On leave.

CLEMSON UNIVERSITY LIBRARY

BAXTER, ANN WEBSTER, *Assistant Professor of Microbiology.*
B.A., Rockford College, 1938; M.A.T., 1964, Ph.D., 1967, University of North Carolina.

BAXTER, LUTHER WILLIS, *Professor of Plant Pathology and Physiology.*
B.S., Eastern Kentucky State College, 1950; M.S., 1952, Ph.D., 1954, Louisiana State University.

BECKWITH, WILLIAM FREDERICK, *Associate Professor of Chemical Engineering.*
B.S., 1957, M.S., 1961, Ph.D., 1963, Iowa State University.

BEER, BETTINA KNUST, *Instructor in History.*
B.A., St. Lawrence University, 1963; M.A., Vanderbilt University, 1966.

BEER, JOACHIM RUDOLPH, *Instructor in History.*
M.A., University of Erlangen, 1967.

BELL, MARSHALL CORNETT, *Associate Professor of Mathematics.*
A.B., 1933, M.A., 1936, University of North Carolina.

BENSON, GUYTON ALAN, *Instructor in Music and Director of Choral Activities.*
B.M.E., Florida State University, 1964; M.M., University of South Florida, 1969.

BENSON, ROBERT TIDD, *Assistant Professor of Vocational Education.*
B.S., 1960, M.S., 1963, Cornell University; Ed.D., Pennsylvania State University, 1968.

BEYERLEIN, ADOLPH LOUIS, *Assistant Professor of Chemistry.*
B.S., Fort Hays Kansas State College, 1960; Ph.D., University of Kansas, 1966.

BIERER, BERT W., *Laboratory Director and Professor of Poultry Science, Livestock-Poultry Laboratory, Columbia.*
V.M.D., University of Pennsylvania, 1934.

BIRKHEAD, PAUL KENNETH, *Associate Professor of Geology.*
A.B., 1951, A.M., 1960, University of Missouri; Ph.D., University of North Carolina, 1965.

BIRTMAN, KENNETH DAVID, *Instructor in Sociology.*
B.A., Northwestern State College, 1966; M.A., Stephen F. Austin State College, 1967.

BISHOP, CARL BARNES, *Associate Professor of Chemistry.*
B.S., Clemson University, 1954; Ph.D., Michigan State University, 1959.

BISHOP, MURIEL BOYD, *Assistant Professor of Chemistry.*
B.A., Huntingdon College, 1952; M.S., Emory University, 1955; Ph.D., Michigan State University, 1961.

BLACK, JOSEPH WILLIAM, *Lecturer in Medical Technology; Co-director, School of Medical Technology, and Pathologist, Anderson Memorial Hospital.*
B.S., University of Kentucky, 1955; M.D., Bowman Gray School of Medicine, 1959.

BLACKMON, CYRIL WELLS, *Assistant Professor of Plant Pathology and Physiology, Edisto Experiment Station.*
B.S., Virginia Polytechnic Institute, 1949; M.S., Trinity University, 1953; Ph.D., Texas A & M University, 1958; Post Doctorate, Yale University, 1958-59.

BLACKWELL, PAUL EUGENE, *Assistant Professor of Military Science.*
Captain, Infantry, United States Army; B.S., Clemson University, 1963.

BLANCHE, JERRY DON, *Instructor in Speech.*
B.S., University of Oklahoma, 1962; M.A., Colorado State College, 1967.

BOLAND, W. ROBERT, *Assistant Professor of Mathematics.*
B.S., Davidson College, 1959; M.A., College of William and Mary, 1963; Ph.D., University of Colorado, 1968.

BOLEN, CLAUDE WALDRON, *Professor of History.*
A.B., Emory and Henry College, 1931; M.A., 1935, Ph.D., 1941, Duke University.

BOND, JOHN HOWARD, *Associate Professor of Microbiology.*
B.S., 1948, M.S., 1949, Louisiana State University.

BOONE, MERRITT ANDERSON, *Professor of Poultry Science.*
B.S., University of Nebraska, 1941; M.S., Michigan State University, 1947; Ph.D., University of Georgia, 1962.

BORGMAN, ROBERT FREDERIC, *Associate Professor of Food Science; Director of Environmental Health Training Program.*
D.V.M., 1947, M.S., 1949, Michigan State University; Ph.D., Kansas State University, 1959.

BOSDELL, FRANCIS ALVIN, *Assistant Professor of Industrial Education.*
B.S., 1949, M.In.Ed., 1966, Clemson University.

BOSE, ANIL KUMAR, *Associate Professor of Mathematics.*
B.S., 1948, M.S., 1956, Calcutta University; Ph.D., University of North Carolina, 1964.

BOST, WILLIAM VICK, *Instructor in English.*
A.B., 1963, M.A., 1964, J.D., 1970, University of North Carolina.

Bowen, William Clayton, *Associate Professor of Agricultural Education.*
B.S., Clemson University, 1932; M.S., Colorado State University, 1940.

Bowie, Patrick Carlton, *Assistant Professor of Mathematics.*
B.S., Georgia Institute of Technology, 1963; M.A., 1965, Ph.D., 1968, Clemson University.

Boyd, Virlyn Alexander, *Associate Professor of Agricultural Economics and Rural Sociology.*
B.S.A., Berry College, 1941; M.S.A., University of Kentucky, 1948.

Bradbury, Douglas Wilson, *Alumni Professor of Machine Design.*
B.M.E., Clemson University, 1940; M.S.E., University of Michigan, 1959; P. E.

Brandon, Craig Arnold, *Associate Professor of Mechanical Engineering.*
B.S.M.E., Duke University, 1959; M.S., Stanford University, 1960; Ph.D., University of Tennessee, 1968; P. E.

Brandt, Graydon William, *Associate Professor of Dairy Science.*
B.S., Ohio State University, 1936; M.S., University of Nebraska, 1938; Ph.D., Ohio State University, 1958.

Brannock, Durant York, Jr.,* *Assistant Professor of French.*
A.B., Elon College, 1954; A.M., Duke University, 1956.

Brannon, Carroll Cleveland, *Associate Professor of Dairy Science.*
B.S., Clemson University, 1934.

Brantley, Herbert, *Associate Dean, College of Forest and Recreation Resources; Head of Recreation and Park Administration Department; Professor of Recreation and Park Administration.*
A.B., 1956, M.A., 1958, Ph.D., 1966, University of North Carolina.

Brawley, Joel Vincent, Jr., *Associate Professor of Mathematics.*
B.S., 1960, M.S., 1962, Ph.D., 1964, North Carolina State University.

Bray, Raymond Derwood, *Visiting Associate Professor of City Planning.*
A.B., 1956, M.A., 1965, University of California.

Broadbooks, John Alan, *Lecturer in Recreation and Park Administration.*
B.Arch., Rensselaer Polytechnic Institute, 1959; M.L.A., University of Georgia, 1969.

Brock, Alton Carr, *Assistant Professor of Aerospace Studies.*
Major, United States Air Force; B.S., Piedmont College, 1963; M.S., Air Force Institute of Technology, 1966.

Brodie, Edmund D., *Assistant Professor of Zoology.*
B.S., Oregon College of Education, 1963; M.S., 1967, Ph.D., 1969, Oregon State University.

Brown, Farrell Blenn, *Associate Professor of Chemistry.*
B.S., Lenoir-Rhyne College, 1957; M.S., 1960, Ph.D., 1962, University of Tennessee; Post Doctorate, Texas A & M University, 1962-63.

Brown, Jonas William, *Associate Professor of Mathematics.*
B.S., North Carolina State University, 1931; M.A., Duke University, 1948.

Brown, Lamar Hamilton, *Associate Professor of Architecture.*
B.Arch., Auburn University, 1948.

Brown, Robert L., *Adjunct Professor of Industrial Management.*
A.B., Samford University, 1947; M.A., University of Alabama, 1951; Ph.D., Purdue University, 1957.

Brown, Susan Henrietta, *Assistant Professor of Industrial Management.*
A.B., 1947, J.D., 1950, University of Georgia.

Bruley, Duane Frederick,* *Associate Professor of Chemical Engineering.*
B.S., University of Wisconsin, 1956; M.S., Stanford University, 1959; Ph.D., University of Tennessee, 1963; P. E.

Bruner, Marlin Harner, *Associate Professor of Forestry.*
B.S., Pennsylvania State University, 1931; M.F., Yale University, 1932.

Bryant, Hallman Bell, *Assistant Professor of English.*
B.A., Emory University, 1959; M.A., University of North Carolina, 1962; Ph.D., Vanderbilt University, 1967.

Buckner, Sam Levi, *Assistant Professor of Education.*
B.S., East Tennessee State University, 1960; M.A., Appalachian State University, 1966; Ed.D., Auburn University, 1970.

Bungay, Henry Robert, III, *Professor of Bioengineering.*
B.Ch.E., Cornell University, 1949; Ph.D., Syracuse University, 1954; P. E.

Burkett, Byron Verner, Jr., *Assistant Professor of Vocational Education.*
B.S., 1964, M.S., 1965, Clemson University.

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* On leave.

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Burt, Philip Barnes, *Associate Professor of Physics.*
A.B., 1956, M.S., 1958, Ph.D., 1961, University of Tennessee.

Burtner, Frank Alan, *Professor of Sociology.*
B.A., M.A., University of Texas, 1938; Ph.D., University of North Carolina, 1958.

Busching, Herbert William, *Head of Civil Engineering Department; Associate Professor of Civil Engineering.*
B.A., B.S.C.E., Valparaiso University, 1958; M.S.C.E., 1963, Ph.D., 1967, Purdue University.

Butler, John Harrison, *Head of Music Department; Associate Professor of Music; Director of Bands.*
B.M.E., West Texas State University, 1955; M.F.A., 1960, Ed.D., 1968, University of Georgia.

Byerley, Neil E., *Part-Time Visiting Lecturer in Industrial Management.*
B.S.B.A., University of Tennessee, 1958.

Byrd, Wilbert Preston, *Experiment Station Statistician; Professor of Experimental Statistics; Chairman, Experimental Statistics and Statistical Services.*
B.S., 1949, M.S., 1952, North Carolina State University; Ph.D., Iowa State University, 1955.

Caffrey, Cletus Barnard, *Associate Professor of Psychology.*
B.A., St. Vincent College, 1956; M.A., 1963, Ph.D., 1966, Catholic University.

Caley, Paul Cochran, *Assistant Professor of Industrial Education.*
B.S., 1963, M.A., 1964, Ph.D., 1969, Ohio State University.

Calhoun, Richard James, *Alumni Professor of English.*
B.A., George Peabody College, 1948; M.A., Johns Hopkins University, 1950; Ph.D., University of North Carolina, 1959; Post Doctorate, Duke University, 1964-65.

Calvez, Daniel Jean, *Instructor in French.*
License ès Lettres, Angers University, 1965.

Cameron, Walter Audry, *Assistant Professor of Vocational Education.*
B.S., North Carolina State University, 1965; M.S., Virginia Polytechnic Institute, 1968; Ph.D., Ohio State University, 1969.

Camper, Nyal Dwight, *Assistant Professor of Plant Pathology and Physiology.*
B.S., 1962, Ph.D., 1966; North Carolina State University.

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CLEMSON ALUMNI ASSOCIATION
1970

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Vice President	Thomas C. Breazeale, '42	Knoxville, Tenn.
Secretary	Joe Sherman, '34	Clemson, S. C.
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Frank Alan Burtner, Ph.D.	*Director of Fraternity Affairs*
Cathy Anne Campbell, B.A.	*Assistant Dean of Women*
George Edward Coakley, B.S.	*Assistant Dean of Students*
Susan Goodwin Delony, M.S.	*Assistant Dean of Students*
Joseph G. Guggino, M.S.	*Assistant Dean of Men*

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Eugenie Ventre Bartmess, M.S.	*Schedule Coordinator*
Reginald Justin Berry, B.S.	*Registrar*
Arnold Mandigo Bloss, B.S.	*Director of Financial Aid*
Albert B. Marx, M.S.	*Associate Director, Admissions and Registration*
William Richard Mattox, M.S.	*Assistant Director of Admissions*
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Burrell Richardson, M.S.	*Manager of Residence Halls*
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John Randolph Anderson, M.S.	*Counselor*

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James Bowers, M.D.	*Physican*
Donald K. Freeman, M.D.	*Psychiatrist*
John Richard Vaughn, M.D.	*Physician*
Ruth Durham, R.N.	*Director of Nurses*

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John Harrison Butler, Ed.D.	*Director of Concert Band and Manager of Concert Series*
Guyton Alan Benson, M.M.	*Director of Choral Music*
Bruce F. Cook, M.A.	*Director of Tiger Band*

UNIVERSITY UNION AND Y.M.C.A.

Buford E. Trent, M.E.	*Director of University Union and Y.M.C.A.*
Nash Newton Gray, B.S.	*Associate Director, Y.M.C.A.*
Otis Duell Nelson, M.R.E.	*Associate Director, Y.M.C.A. and Foreign Student Adviser*
William Carlisle Wooten, B.C.E.	*Youth Director, Y.M.C.A.*

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Frank James Howard, B.S.	*Director of Athletics*
Henslee Clifford McLellan, M.S.	*Associate Director of Athletics*
Eugene P. Willimon, B.S.	*Assistant Director of Athletics*
Duane Frederick Bruley, Ph.D.	*Head Coach, Tennis*
H. C. Greenfield, M.S.	*Head Coach, Track and Cross Country*
Ibrahim M. Ibrahim, Ph.D.	*Head Coach, Soccer*
Cecil Wayne Ingram, M.S.	*Head Coach, Football*
Robert Morgan Jones, B.S.	*Head Coach, Golf*
Taylor Osborne Locke, B.A.	*Head Coach, Basketball*
James Banks McFadden, B.S.	*Director of Intramural Athletics*
Carl Manning McHugh, B.S.	*Head Coach, Swimming*
Robert William Smith, B.S.	*Superintendent, Athletic Physical Plant*
Billy Hugh Wilhelm, A.B.	*Head Coach, Baseball*

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LITTLEJOHN COLISEUM

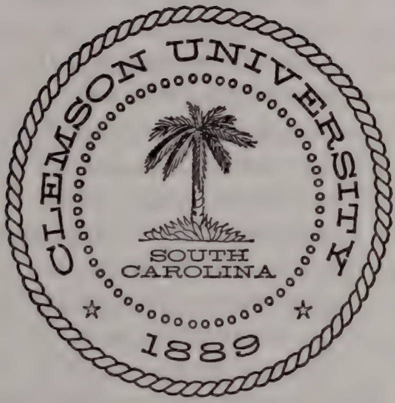
Robert William Smith, B.S.	*Supervisor of Littlejohn Coliseum*

UNIVERSITY BOOKSTORE

John C. Cureton	*Manager of University Bookstore*

UNIVERSITY CANTEENS

F. D. Miller	*Manager of University Canteens*



PART II

INFORMATION

PART II—Information

GENERAL INFORMATION

Clemson is a land-grant, state-supported university. Clemson is fully accredited by the Southern Association of Colleges and Schools. Curriculums are accredited by the American Chemical Society, Engineers' Council for Professional Development, National Architectural Accrediting Board, and Society of American Foresters.

The forty-seven undergraduate and forty-eight graduate curriculums under the Colleges of Agriculture and Biological Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, and Physical and Mathematical Sciences, the School of Nursing, and the Graduate School form a background of training for the hundreds of occupations and professions in which Clemson graduates engage. The University is organized on a basis whereby it retains a clear entity through the interrelationships of colleges, schools, and departments providing a well-balanced fundamental and general educational program.

The enrollment of Clemson has grown from 446 students at the opening of the University in 1893 to 8,038 for the first semester, 1970-71, including 437 at the Greenville and Sumter campuses. Since the opening of the University, through the first semester 1970-71, 61,381 students have attended Clemson, and of this number, 21,506 have been awarded the bachelor's degree. During this same period, 87 associate degrees, 1,558 master's degrees, and 190 Doctor of Philosophy degrees have been awarded.

ADMINISTRATIVE ORGANIZATION

The government of the University is vested in a Board of 13 members, including 6 elected by the Legislature and 7 life and self-perpetuating members, in accord with the Clemson will. The President of the University is the chief executive and administrative officer appointed by the Board of Trustees; and under the President there are four areas of administration, each headed by a chief administrative officer responsible to the President. The organizational units under each of these officers are outlined below:

I. Vice President for Academic Affairs and
Dean of the University

Dean of Undergraduate Studies
  1. The University Library
  2. The Summer Sessions

Dean of Graduate Studies and University Research
  1. The Graduate School
  2. The Computer Center
  3. The Office of University Research

Dean of University Extension
  1. Clemson University at Greenville
  2. Clemson University at Sumter

A. College of Agriculture and Biological Sciences
B. College of Architecture
C. College of Education
D. College of Engineering
E. College of Forest and Recreation Resources
F. College of Industrial Management and Textile Science
G. College of Liberal Arts
H. School of Nursing
I. College of Physical and Mathematical Sciences
J. The Belle W. Baruch Institute in Forestry, Wildlife Science and Marine Biology
K. Water Resources Research Institute

II. Vice President for Business and Finance and Comptroller
  A. Accounting Division
  B. Personnel Division
  C. Physical Plant Division
  D. Purchasing Division
  E. Auxiliary Enterprises
  F. The Clemson House Hotel

III. Vice President for Development
  A. Alumni Relations
  B. Public Relations
  C. Communications Center
  D. Planning and Corporate Relations

IV. Vice President for Student Affairs and Dean of Students
   - A. Office of the Dean of Students
   - B. Residence Halls Office
   - C. Office of Admissions, Registration, and Financial Aid
   - D. University Union and Y.M.C.A.
   - E. Music Activities
   - F. Placement Office
   - G. Counseling Center
   - H. Athletic Department
   - I. Student Health Service
   - J. University Canteens
   - K. University Bookstore
   - L. Littlejohn Coliseum

REQUIREMENTS FOR ADMISSION

To receive consideration for admission to Clemson, the applicant must, as a rule, present a transcript of his high school record giving evidence of graduation, and submit an official copy of his scores for the College Board tests used as an entrance examination. In reaching an admissions decision, the examination scores along with the student's academic preparation, rank in class, and the recommendation of the high school principal will be weighed carefully.

In addition, students may qualify for entrance by:

(1) Achieving satisfactory scores on the College Board examinations and presenting a South Carolina High School Certificate (awarded by certificate examination). This provision applies only to adult candidates 21 or more years of age or to those who have served at least two years of active duty in the Armed Forces.

(2) Achieving satisfactory scores on the College Board examinations and completing a minimum of 12 high school units. Students in this category must achieve above average scores on the entrance examination and have superior high school records.

(3) Achieving satisfactory scores on the College Board examinations and meeting the additional requirements for entrance with advanced standing. As minimum additional criteria, the transfer applicant must present a statement of honorable dismissal from the institution last attended, an original transcript of his record from each college or university attended, and an official statement that he is eligible to return to the institution last attended. Candidates meeting these requirements will then be considered care-

fully in the light of the quality of their previous record, and work completed in other colleges with a grade at least one letter grade higher than the lowest passing mark will be evaluated in terms of equivalent courses in the curriculum at Clemson selected by the student.

Finally, various nonintellective factors will be considered in a few cases where it is impossible to make a positive decision on the strength of aptitude and previous academic performance alone.

There is no application fee, but an admissions deposit is required following the issuance of a provisional acceptance. Instructions concerning this deposit will be included in the acceptance letter.

Application Forms. Forms to be used in applying for admission to the University may be obtained by writing the Office of Admissions and Registration, Clemson University, Clemson, S. C. 29631.

Entrance Examinations. All freshman candidates for admission—and many transfer applicants also—must complete the College Entrance Examination Board SCHOLASTIC APTITUDE TEST. Those who at accredited colleges have completed 30 or more semester hours, or its equivalent, with a "C" average or above on all work attempted are exempted from this requirement. This exception does not apply to those enrolled in technical institutes, or in non-college parallel programs at institutions offering both transfer and terminal curriculums. For August enrollment, one needs to complete the SAT no later than the preceding April.

In addition and with the exception of those transferring acceptable college credit in mathematics, candidates should take one of the College Board Achievement Tests in mathematics as placement in this subject will be determined by the score one achieves. It is suggested that students sit for the Level I examinations; however, either Level I or II is acceptable.

Applicants who will have completed two or more years of high school French, German, Russian, or Spanish and who will enroll in a curriculum which includes a modern foreign language should take the appropriate language achievement test. These candidates may qualify for advanced placement with credit in language on the basis of a satisfactory score on this test.

Students attending unaccredited private schools are strongly advised to complete three achievement tests, including English, mathematics, and one subject of their choice.

August applicants will need to complete all achievement testing no later than the preceding May. Usually it is to one's advantage to take the achievement tests in March of the senior year in high school.

Candidates who have completed the required tests previously may have their scores reported to Clemson by directing a request to the College Entrance Examination Board together with a fee of $2. Others may secure a BULLETIN OF INFORMATION and an application for the tests from their local high school or at one of the Board's offices, the addresses of which are: P. O. Box 592, Princeton, New Jersey 08540, and for residents of the West, P. O. Box 1025, Berkeley, California 94701. Only those scores reported directly to the Clemson University Admissions Office from Princeton or Berkeley will be acceptable.

All candidates are reminded to forward applications for the entrance examinations as indicated in the Bulletin of Information, and not to Clemson University.

Applicants for enrollment in Architecture must also take the ARCHITECTURAL SCHOOL APTITUDE TEST which is given at most schools of architecture in November, January, and March. Applications for this test may be obtained from a school of architecture or from Educational Testing Service, Princeton, New Jersey 08540.

Advanced Placement by Examination. In addition to earning credit by the usual method involving classroom attendance, students may receive credit toward their degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Matriculation. Upon arrival for the opening of the session, new students report to the Office of Admissions and Registration to complete enrollment. A student's matriculation is equivalent to his pledge to conform to the rules of the institution. Any admission gained or matriculation made irregularly is subject to cancellation.

Students from Other Countries. A limited number of well qualified students from other countries are accepted. The application for admission must be in English on the official application form furnished by the Office of Admissions and Registration. Official transcripts of all high school and college level work which the applicant has undertaken should accompany the application. They must also complete the entrance examination requirements discussed previously, although in a few unusual cases a substitute examination is authorized.

In addition to academic and personal qualifications equivalent to those required of United States citizens, the applicant from another country is required to submit evidence of his possessing dollar resources adequate without assistance from the University for at least the first year of his course of study, including round trip travel expenses. The University is unable to grant scholarship or loan assistance to students from abroad, and there is little likelihood that any type of employment may be secured.

If accepted, students from other countries should have a minimum of $1,300 in their possession upon reporting to the University. This amount is sufficient to make the entrance payment which includes tuition, fees, and living expenses for a semester, and for books and supplies. Foreign students will also be required to purchase student accident and health insurance.

EDUCATIONAL BENEFITS FOR VETERANS AND WAR ORPHANS

The Veterans Administration provides educational assistance for veterans and children of deceased or totally disabled veterans who meet requirements of applicable laws and regulations. Any veteran or child of a deceased or totally disabled veteran should communicate with the nearest Veterans Administration office to determine whether or not he is entitled to any educational benefits.

SELECTIVE SERVICE

Registration. For the benefit of students who become 18 years of age during the school year, provision has been made for such students to register for Selective Service in the Office of Admissions and Registration on the campus. The registration is then sent through channels to the registrant's local board. Regulations provide that registration may be accomplished on the 18th birthday or within five days thereafter.

Deferment. Due to the changes occurring periodically, all registrants should keep themselves informed of current regulations governing deferments. Questions concerning student deferments may be referred to the Office of Admissions and Registration.

EXPENSES

Settlement of University Fees. The schedule of semester charges for all undergraduate students—full-time, part-time, and auditing—is shown on the pages which follow. The entire semester's expenses are due and payable at the beginning of each semester, and no student is officially enrolled until all semester expenses have been satisfied. In special cases the University will accept at the beginning of a semester a non-interest bearing promissory note for a portion of the semester residence-hall rent and semester-plan board fee. Amounts up to $65 for room rent and $115 for board fee may be included in the note. In such cases, a note for the first semester charges will be due October 10, and a note for the second semester charges will be due March 1.

A $60 advance payment of room rent is required for a room reservation for the fall semester. This payment must be made by cash, check or money order and should be sent to the Residence Halls Manager's Office with the completed "Student Application for Room Reservation" card not later than July 1. The $60 advance payment of room rent will be deducted from the amount otherwise due for the first semester's expenses. All other transactions relating to payments should be conducted with the Accounting Division. All checks and money orders should be made payable to Clemson University. A personal check given in payment of University expenses which is returned by the bank unpaid, immediately creates an indebtedness to the University.

The University reserves the right to adjust charges to current costs.

Past Due Student Accounts. Any indebtedness to the University which becomes past due immediately jeopardizes the student's enrollment, and no such student will be permitted to graduate or register for a subsequent semester or summer school term. Further, any student who fails to pay all indebtedness to the University may not be issued an honorable discharge, transcript, or diploma.

Refund of Academic Fees for Students Enrolled for Less than a Full Semester. No adjustments in charges will be made on a semester's tuition and fees after five weeks from the date classes begin for the semester. Charges for periods of attendance of five weeks or less during a semester shall be made on the following basis:

Two weeks or less	20%
More than 2 but not more than 3 weeks	40%
More than 3 but not more than 4 weeks	60%
More than 4 but not more than 5 weeks	80%
More than 5 weeks	100%

Special provision has been made for a student who is required to discontinue his enrollment to report for active duty in the Armed Forces of the United States. Such students shall be charged for tuition, maintenance and activity fee, and medical fee on a daily pro rata basis, holidays excepted, instead of the percentage basis stated above, provided that such discontinuance of enrollment is the result of circumstances, conditions, or actions over which the student has no control.

Refund of Dining Hall and Residence Hall Fees. Specific information relating to living-expense refunds is given in the sections on dormitories and dining hall.

Schedule of Charges. The schedule of semester charges for the 1970-71 session is as follows:

SCHEDULE OF SEMESTER CHARGES 1970-71 SESSION

Resident of South Carolina (Full-time student)	
Tuition	$ 75.00
Matriculation Fee	5.00
University Fee	205.00
Medical Fee	25.00
Semseter Total Excluding Room and Board	$310.00
Non-Resident of South Carolina (Full-time student)	
Tuition	$200.00
Matriculation Fee	5.00
University Fee	430.00
Medical Fee	25.00
Semester Total Excluding Room and Board	$660.00

Room:

West Campus (Air-Conditioned with Telephones)	
Johnstone Hall: New Sections A, F	$195.00
Johnstone Hall: Old Section F	165.00
Bowen, Bradley, Donaldson, Norris, Wannamaker Halls	210.00
East Campus (Air-Conditioned with Telephones)	
Barnett, High Rise 3, Lever, Manning, Mauldin Halls	210.00

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West Campus (Air-Conditioned with Telephones)

Johnstone Hall: Section D	150.00
*Section E	150.00
*Benet, Cope, Young Halls	180.00
Geer, Sanders Halls	180.00

West Campus (Without Air-Conditioning or Telephones)

**Johnstone Hall: Old Sections A, B, C	135.00

Board (5-day plan, Monday through Friday)	$220.00	$220.00
Board (7-day plan)	$275.00	$275.00

Part-Time Student. Undergraduate students taking less than 12 semester credit hours will be charged each semester according to the following schedule. These fees do not provide for admission to athletic events, concert series, etc.

	S. C. Resident	*Non-Resident Student*
Matriculation Fee (non-refundable)	$ 5.00	$ 5.00
Tuition (per semester hour)	6.00	16.00
University Fee (per semester hour)	14.00	28.00

Auditing. Charges for auditing are made each semester according to the following schedule:

Tuition (per semester hour)	$ 3.00	$ 8.00
University Fee (per semester hour)	7.00	14.00

Graduate Students. For further information concerning advanced degrees see *The Graduate Bulletin,* which may be obtained from the Office of the Dean of Graduate Studies and University Research.

Late Registration Fee. To prevent or reduce the problems incident to late registration, registration schedules are set for specific days, and certain definite procedures are outlined. A student has not completed registration until all of the required steps are taken, the final one being the return of the properly signed Class Registration Card to the Office of Admissions and Registration. Any student who fails to register for classes on the prescribed class registration days will be charged a late registration fee of $10. This late registration fee applies to full-time and part-time students.

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* By the 1971-72 academic year, it is anticipated that telephones will be installed in the rooms of Benet, Cope, Young Halls, and Section E of Johnstone Hall; this will result in an increase of $15 per semester in these rooms.

** By the 1971-72 academic year, it is anticipated that old Sections A, B, and C of Johnstone Hall will be air-conditioned resulting in a room rent increase of $15 per semester.

Late Payment Fee. Any student who registers for classes on or before a designated date each semester has three additional working days to make satisfactory settlement of all expenses without being charged a Late Payment Fee. Once begun, a Late Payment Fee of $5 per day will be charged until satisfactory settlement of all fees is made.

Definition of Residence for the Purpose of Determining Status for Enrollment in Clemson University

1. A resident student is one who was continuously domiciled in South Carolina for twelve months immediately preceding his initial enrollment in the University. The term "domiciled in South Carolina" excludes those students in the State primarily to attend the institution and whose abode in South Carolina has been established as a technical bar to the higher tuition and fee charges.

2. Attendance at an educational institution is usually interpreted as temporary residence. Accordingly, a student neither gains nor loses residence solely by such attendance. Registration for voting, the act of voting, purchase of property, payment of taxes and employment in South Carolina are not necessarily by themselves proof of residence in the State for the purpose of enrolling in the University; nor does birth in South Carolina or direct descent from South Carolina forebears necessarily prove domicile in South Carolina.

3. The residence of a married woman is that of her husband, if living together; however, a wife not living with her husband may establish separate domicile. A non-resident woman who marries a resident of South Carolina shall be accepted as a resident student at the beginning of the next semester following such marriage; and a resident woman who marries a non-resident shall keep her residence status so long as she maintains continuous enrollment in the University. A non-resident man who marries a resident woman does not thereby gain resident status.

4. The residence of a minor child (under 21 years of age) is that of the father; or of the mother if the father be not living or if the parents are separated and the child habitually resides with the mother; or, if both parents are dead, with his legally appointed guardian, or anyone else with whom he habitually resides in the absence of formal legal designation.

5. A minor may become emancipated (freed from parental domicile) through marriage, formal court action, abandonment by

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parents, or positive action on his own part evidential of his alienation of parental domicile. To qualify under the latter category, a minor must have completely separated himself from the parental domicile and have proved that such separation is complete and permanent. Mere absence from the parental domicile is not proof of its complete abandonment. If an applicant can provide adequate and satisfactory proof of complete emancipation and of his having come to South Carolina with the intention of establishing domicile, he may be granted resident classification at the next enrollment occurring after the expiration of twelve months following establishment of domicile, excluding time spent as a student at the University. The burden of proof of domicile and emancipation shall be upon the applicant.

6. If it is established to the satisfaction of the University that parents have moved to South Carolina with every intention of remaining permanently and establishing themselves as citizens of the State, the dependent children of such parents may be classified as resident students at the first enrollment after the parents move into the State. If the parents of a resident student move to another state with the intention of establishing domicile there, the student shall at the first enrollment after twelve months from the date of establishment of said home by his parents be classified as a nonresident student; however, the student may continue in resident status if he reaches 21 years of age within the twelve-month period, or if he establishes evidence of emancipation.

7. A person enjoying majority privileges (over 21 years old or an emancipated minor) who has resided in South Carolina continuously for twelve months immediately preceding his initial enrollment in the University shall be classified as a resident. If, after enrollment, such person can provide adequate and satisfactory proof of his establishing domicile in South Carolina and his intention to remain permanently as a resident of the State, he may be granted resident classification at the next enrollment occurring after expiration of twelve months following establishment of domicile exclusive of time spent as a student at the University.

8. Dependents of members of the Armed Services and Federal employees stationed in South Carolina are permitted to attend the University, if accepted, by paying resident fees without regard to resident status, provided that if such military personnel or employees are ordered away from the State, their dependents may continue to have this privilege while they attend the University.

9. Children and dependents of regularly employed Clemson University personnel are permitted to attend the University, if accepted, by paying resident fees without regard to residence status, provided that if such person terminates University employment and departs the State, the child or dependent may retain this privilege so long as continuous enrollment is maintained in the University.

Any student or prospective student in doubt concerning his residence status must bear the responsibility for securing a ruling by stating his case in writing to the Dean of Admissions and Registration.

Books and Supplies. The cost of books is not included in the Schedule of Semester Charges. The cost of books and supplies at the beginning of the semester will be approximately $50, except for students enrolling in Architecture the cost will be approximately $75.

Student Depository. For the convenience of students, the University operates a depository in the Bursar's Office where money can be deposited and withdrawn as the occasion may demand. This service is purely local. Students are urged to deposit their money and not to keep it in their rooms.

Optional Expenses. It is not possible to give an estimate of a student's expenditures for such amusements as dancing, motion pictures, etc. This depends largely upon the disposition of the student. The University endeavors to reduce to a minimum the temptation to spend money needlessly, but the authorities cannot be responsible for a student's private expenditures. This must be a matter between the student and his parents.

Transcripts. Official transcripts of scholastic records are issued on request. One transcript is furnished free; additional copies are issued for $1 each. Remittances for transcripts should be made payable to Clemson University, but should accompany transcript requests and should be mailed to the Office of Admissions and Registration.

STUDENT HOUSING

The University residence halls will accommodate 5,190, two students being assigned to a room. The University also has 289 individual units for its married students. All unmarried first-year students entering the University directly from high school or preparatory school, not residing with parents, guardians or close relatives, are required to live in University-owned residence halls. All stu-

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dents in their second or more years in college are eligible to live off-campus. Students who are assigned a room in University residence halls will be required to sign a Residence Hall Contract relating to terms and conditions of occupancy for the full academic year. Those students living off-campus will fill out an off-campus locator card as part of the registration process and will report all changes of address as they occur. The Residence Halls Office maintains the off-campus locator file and provides information pertaining to off-campus students.

Application for Residence Hall and Advance Payment. An application for residence hall accommodations will be forwarded to those students who are accepted by the University for the fall semester, provided they have paid the $50 admissions deposit. These applications are to be completed and returned with a $60 advance room payment to the Residence Halls Office at the earliest practicable date. After July 1, the $60 advance payment will not be accepted. Students requesting accommodations after that date must pay the full semester's rent in order to receive a room assignment.

Students who have made an advance payment and later decide not to enroll or to live in the residence hall may obtain a refund of the advance payment provided notification of intent and request for refund is received at the Residence Halls Office prior to July 1. When such notification and refund request is not received by the deadline date, no refund of advance payment will be made.

Normally, residence hall accommodations are available to those students who enter the University at the beginning of the second semester, therefore, the advance payment is not now required of students entering at that time.

Notification of Assignments. As soon as room assignments are made, students are advised of the assignment and furnished information regarding occupancy.

Assignment Changes. Students who desire to move from the assigned room may request a room change at the Residence Halls Office. However, no approval of these requests will be made until after the last day for matriculation during any semester. Fee adjustments will be made when moving to a room which rents at a rate different from that of the originally assigned room.

Opening and Closing of Residence Halls. The University residence halls officially open for undergraduate students at 8 a. m.

the day prior to matriculation date for new students and close at 8 p. m. the day scheduled for graduation exercises of the term or semester. Residence hall fees cover only the time between the day before matriculation and the scheduled date of graduation exercises or end of term when no graduation exercises are scheduled.

For official holidays which occur during the course of a semester, the University reserves the right to close certain halls and to require students remaining on the campus to move to another hall for the duration of the holiday period.

Student Responsibility for Damages. The University holds residents responsible for any damages other than normal wear that occur to their rooms and furnishings. Damages will be assessed by the University and the student will be billed for repairs or replacements. Students should note on the property certificate immediately upon occupancy any conditions reflecting prior damages which have not been corrected.

Responsibility for Student Possessions. Although every precaution is taken to maintain adequate security, the University cannot assume the responsibility for the loss of or damage to student possessions resulting from any cause.

Refund of Residence Hall Fee. Except for the stated regulations governing the $60 advance payment to reserve a room for the first semester, refunds, when authorized, will be made on a daily pro rata basis.

Reservation of Right to Change Fees and Regulations. The University reserves the right to make changes in its fees, charges, rules, and regulations.

RESIDENCE HALLS

West Campus. The University has available 3,606 spaces in eleven residence halls. Each is fully air-conditioned. Johnstone Hall, the largest of these residence halls, has rooms equipped with lavatories and individual clothes lockers. They are furnished with bunk-type beds, a study table and chairs. Rooms in Benet, Young, Cope, Geer, and Sanders Hall along with rooms in new annexes "A" and "F" of Johnstone Hall are equipped with lavatories, walk-in type closets, and are furnished with single beds, individual study desks and chairs. Also located on West Campus are Donaldson, Bowen, Wannamaker, Bradley, and Norris Halls. The residence

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halls are completely carpeted and rooms are furnished with individual clothes lockers, single beds, individual study desks with reading lamp, and chairs. Some of the residence halls located on this campus are equipped with telephones. Students will receive information concerning room telephones when they receive room application forms.

East Campus. In this area there are 1,584 spaces available in five residence halls. Two of these, Mauldin and Barnett Halls, are modern four-story structures with 144 spaces each. The remaining three, Manning Hall, Lever Hall, and High Rise No. 3, are eleven-story structures all of which were constructed during the last four years. Each will house 432 students. All residence halls are air-conditioned and provide the most modern student accommodations. Rooms are arranged in suites of six accommodating 12 students. Each room contains two closets, two chest of drawers with wall-hung mirrors, individual reading lamps, desks and chairs. Draperies must be furnished by the occupants. Studies and laundry rooms are available on each floor. Also available in these residence halls are lounges, kitchenettes, T.V., and recreation rooms. All rooms located on East Campus are equipped with telephones.

MARRIED STUDENT HOUSING

Clemson provides comfortable and economical housing for its married students. There are three housing areas consisting of 139 single Prefab units, 100 East Campus apartments contained in 50 duplex buildings, and 50 Littlejohn apartments in 11 buildings.

All married student housing units have two bedrooms, living room, kitchen and bath. East Campus apartments are the newest and are equipped with stove and refrigerator. The Littlejohn apartments and Prefabs are not equipped with stoves and refrigerators.

Booklets describing these facilities are available and will be furnished upon request to the Housing Office of the University. Monthly rental fees are: Prefabs, $36; Littlejohns, $51 for interior and $54 for end units; East Campus, $69.

STUDENT FOOD SERVICE

The University Dining Halls provide several food service plans for the students:

(1) A 5-Day Board Plan (15 meals) Monday through Friday—holidays excluded. The fee for this plan is $440 per year and may be paid in two installments—one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

(2) A 7-Day Board Plan (21 meals) Monday through Sunday—holidays excluded. The fee for this plan is $550 per year and may be paid in two installments—one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

Both the 5-Day and 7-Day Board Plans will begin the first day of classes and end on the day which is scheduled for graduation. (These dates are listed in the University Calendar appearing in this catalog.) Individual meals may be obtained in the student dining halls prior to the day classes begin.

(3) Students who are not on a board plan may purchase tickets for individual meals at prevailing prices. Except on special occasions, a-la-carte service will not be offered in the Student Dining Halls.

All students who enter the University for the first time from high school or preparatory school and who live in University residence halls are required to subscribe to either the 5-Day or the 7-Day Board Plan. Either the 5-Day or the 7-Day Board Plan is also recommended to upperclassmen who reside in University residence halls.

Upperclassmen and graduate students have the option at the time of their enrollment of electing either the 5-Day or the 7-Day Board Plan provided they agree to pay the board-plan fee for the period of their enrollment during the academic year.

A student having selected the 5-Day or the 7-Day Board Plan for the academic year may not withdraw as long as he remains enrolled, except in the case of marriage or circumstances which are determined by the University to be beyond his control.

LAUNDRY–DRY CLEANING

A plant with modern equipment is conveniently located on campus to service the laundry and dry-cleaning requirements of the student. Reasonable prices are charged for individual items on a cash-and-carry basis.

The University will not be liable for lost or damaged items unless reported within two days after the delivery date, and then for not more than the actual depreciated value of such articles as have been lost or damaged.

Coin-operated washing machines and dryers are available in the laundry building and several of the dormitories.

A commercially operated student linen-rental service is also available. Information regarding this service will be forwarded to all students who are accepted for enrollment in the University.

MEDICAL EXAMINATIONS

Completion of a medical history and physical examination record is required of all new students entering Clemson University for the first time. This examination must be completed by the student and the student's own physician or the health service of the school from which he graduates or transfers. This examination must be reported on a special form provided for this purpose by the University and mailed directly to the Director of Student Health Service. This should be received at least four weeks prior to matriculation to give time for processing; otherwise registration may be delayed. Incomplete forms will be returned.

The University requires that all new students have a current tetanus toxoid series or booster (within five years), a smallpox vaccination (within four years) and also immunization against poliomyelitis. The oral (Sabin) type vaccine is preferred. All new students are also required to have a skin test for tuberculosis within one year prior to admission. If this test is positive, a chest X-ray is also required. All positive reactors will then be required to have an annual chest X-ray. These follow-up X-rays after admission will be done at the Student Health Service.

STUDENT HEALTH SERVICE

Student Health Service: Cost per Semester $25. Payment of the Student Health Service fee is required of all students living in University residence halls and all full-time students even though they do not reside in University housing. The Student Health Service is housed in the new Redfern Health Center and is complete with outpatient department and a 34-bed hospital. The staff consists of three full-time physicians, including the director, a psychiatrist, thirteen full-time registered nurses and a full-time registered laboratory technician and a full-time registered X-ray technician. In addition, a sufficient number of nurses' aides, secretarial workers, orderlies and maids for 24-hour-a-day operations are employed. The best of modern equipment is available for student use.

The Student Health Service at Clemson University has several important functions. All of these are aimed at keeping the student in good health so that he may effectively pursue his school work. There is, of course, the basic function of medical care for the ill and injured. This is a vital part of its work. In addition to this, the Student Health Service attempts to put strong emphasis on health rather than illness. This begins with the entrance medical form. In laying out this form an attempt is made to get information, examinations and preventive medical procedures carried out to better equip the staff in protecting the student from illness and to serve as a guide for the care of pre-existing medical problems.

As the student progresses through his academic experiences, other procedures may be required or highly recommended. These are primarily an effort to teach the individual self-responsibility for maintenance of his own health, protection of the health of those around him, and locate possible hidden diseases. The Health Service also has the position as the source of medical information as well as responsibility for indicated medical action: diagnostic, therapeutic and preventive.

The medical fee paid by each student covers the services of the University physicians, the health service staff and equipment for most illnesses and injuries occurring on or around the campus. There are certain things, however, that it does not include, such as fees for routine physical examinations for employment or transfer to another school and fees for outside physicians when called in for consultation, medical or surgical services performed away from the University or for accidents occurring off the campus. The fee also covers medication for acute illness but not for chronic illness lasting over two weeks or for pre-existing illness. Although ambulance transportation to a general hospital for serious illness or injury occurring on campus will, of course, be arranged, the expense for this service is the responsibility of the student. Transportation for less urgent ailments and routine visits can be arranged through the Health Service at the expense of the student. An emergency vehicle for local use is maintained by the Security Department.

The right of the Director of the Student Health Service, with the approval of the proper University authority, to obtain any needed extra services in behalf of any student under his care is hereby expressly reserved.

The Student Government, with full approval of the administration, offers a plan of accident and sickness insurance to full-time students. Each year, prior to the beginning of the fall semester, complete information on this insurance plan will be sent to students. This insurance is inexpensive and is designed to cover major medical expense not covered by the Health Service. It is highly recommended.

UNDERGRADUATE FINANCIAL AID

General. The Office of Student Financial Aid, operating in conjunction with the University Honors and Awards Committee, is responsible for coordinating all types of financial assistance administered by the University. Currently available financial aids consist of scholarships, student loans, grants, and part-time employment. It must be realized that any program of financial assistance can only be supplementary and that the basic financial responsibility remains that of the applicant and his parents.

Application Procedure. Beginning in January of each year all eligible students may apply to the Student Financial Aid Office for any type of financial assistance desired for the coming school year. Prompt consideration may be afforded only those applications submitted directly to that office rather than to the individual colleges, schools, and departments. All requests—except for part-time employment—must be supported by a Parents' Confidential Statement filed directly and renewed annually with the College Scholarship Service, Box 176, Princeton, New Jersey 08540. Action on requests for aid will be based upon scholastic and activity records, eligibility to attend Clemson, and financial resources. Prospective students must have received their final acceptance for enrollment from the Admissions Office before complete action may be taken upon their requests for aid. Applicants will be notified when they are selected for specific types of assistance and should promptly indicate their acceptance. The Office of Student Financial Aid reserves the right to consider only those aid applications filed with that office, prior to cutoff date(s), and supported by requisite financial information (from College Scholarship Service). Further information and application forms may be secured by contacting the Student Financial Aid Office, Tillman Hall, Clemson University, Clemson, South Carolina 29631. Telephone 656-2285 (Area Code 803).

SCHOLARSHIPS FOR FRESHMEN

These awards will be based upon high school records, entrance examination scores, and other qualifications established by the selection committees. Completed entrance and scholarship applications, together with a transcript of high school work through the first semester of the senior year, must be submitted by February 1 in order to be considered. For purposes of scholarship application, the College Entrance Examination Board tests should be taken in time to allow our receipt of scores not later than February 1.

Marshall Williams and Grace Cornett Bell Memorial Scholarships. Income from a fund donated by Mrs. Bell and family provides one or more annual awards for students (freshmen or upperclassmen) enrolled in the College of Liberal Arts or the College of Physical and Mathematical Sciences with preference afforded those concentrating in mathematics or English curriculums. Selection is based upon academic progress, moral character, and financial need.

Albert Blanchard Carr Scholarships. Awarded each year to students exhibiting academic ability and financial need. May be renewed provided satisfactory academic progress is made by the recipient and financial need continues.

The J. H. Cochran Memorial Scholarship. An annual award of $400 provided by the South Carolina Pest Control Association for an Entomology major (undergraduate or graduate). Selection is based upon scholarship, leadership, character and interest in the field of Entomology.

The E. V. Correll Scholarship. A $500 award is made available annually by the Palmetto section of the American Association of Textile Chemists and Colorists to a student who is planning to major in the Textile Chemistry curriculum. Selection is usually limited to an entering freshman student showing need. However, it may be renewed for succeeding years if the student's academic records show satisfactory progress.

Dow Chemical Co. Scholarships. Two $500 awards are available annually to students (freshmen and upperclassmen) majoring in Chemical Engineering.

Educational Opportunity Grants. Non-reimbursable Federal grants, renewable if satisfactory academic progress is maintained, are available from the University for those entering freshmen of exceptional financial requirements. Grants must be matched by scholarships, loans, or other aid. Selection is based upon financial need and academic promise.

Edgar and Emily Hesslein Scholarships. Income from a fund donated by Neuss, Hesslein, and Company provides two $600 scholarships annually. Preference is afforded residents of Marlboro County, South Carolina. Selection is based upon scholastic excellence and financial need. Renewal subject to academic achievement.

Federal Nursing Scholarships. Federal grants, renewable if satisfactory progress is maintained, are available from the University for those entering freshmen of exceptional financial need enrolled in the baccalaureate Nursing program. Selection is based upon academic achievement and potential and financial need.

The Ira S. Hurd Scholarship. A $500 award is made available annually by the Palmetto section of the American Association of Textile Chemists and Colorists to a student who is planning to major in the Textile Chemistry curriculum. Selection is usually limited to an entering freshman student showing need. However, it may be renewed for succeeding years if the student's academic records show satisfactory progress.

Sherwood E. Liles ('00) Engineering Scholarship. Income from a fund donated by his four sons provides an annual $500 scholarship to a student in the College of Engineering. Normally renewable provided satisfactory academic progress is achieved. Selection is based upon academic ability, financial need, extracurricular activities, and South Carolina residence.

Jonathan Logan Scholarships. Two $2,000 awards, to be paid in equal installments during four years of satisfactory undergraduate study, are provided annually by the David Schwartz Foundation to be available to freshmen who enroll in the College of Industrial Management and Textile Science.

William J. Neely Scholarships. Funds donated by friends and associates of the late William J. Neely provide annual $500 scholarships for entering freshmen. May be renewed if academic achievement indicates such renewal to be appropriate.

R. F. Poole Alumni Scholarships. To encourage academic excellence, renewable $1,000 scholarships are awarded annually to incoming freshmen with outstanding academic potential.

George E. and Leila Giles Singleton Scholarship. Income from a fund donated by Mr. G. H. Singleton ('19) provides an annual $300 award to a student accepted for enrollment in an agricultural curriculum. The award is for an entering freshman and may be renewed for an additional year. Selection is based upon academic achievement, character, financial need, and South Carolina residence. Preference will be given male students.

South Carolina Electric and Gas Company Scholarship. A $500 scholarship is available each year to a student whose parents or guardians are customers of the South Carolina Electric and Gas Company or customers of the Department of Public Utilities of Orangeburg, Winnsboro, or McCormick. Recipient must be in upper one-third of class scholastically, have demonstrated outstanding leadership qualities, and require financial assistance. Renewal subject to academic achievement.

South Carolina Fresh Fruit and Vegetable Association Scholarship. A $1,200 award, to be paid during four years of satisfactory undergraduate study, is available annually to a male South Carolinian who enrolls in the Horticulture (Fruit and Vegetable major) curriculum.

South Carolina Pest Control Association Scholarship. A $200 award is available annually for an Entomology major (entering freshman or upperclassman). Selection is based upon scholarship, leadership, character, and financial need.

South Carolina Poultry Improvement Association Scholarships. A $300 award is available annually to a freshman majoring in Poultry Science. An additional $300 award is available each year for a sophomore, junior, or senior.

The Steel Heddle Textile Scholarship. Two $2,800 awards, to be paid in equal installments during four years of satisfactory undergraduate study toward graduation is available annually for a freshman who enrolls in the Textile Chemistry, Textile Science, or Industrial Management curriculum.

J. P. Stevens & Co. Scholarship. A $2,000 award, to be paid in equal installments during four years of satisfactory undergraduate study, is available annually to a freshman who enrolls in a Textile curriculum.

Strom Thurmond Scholarships. Income from a fund donated by Senator Strom Thurmond provides two or more annual grants for worthy and needy entering freshmen from the State of South Carolina. Award of these grants will be in conjunction with participation in one of the established loan programs with which the University is affiliated.

Western Electric Fund Scholarships. Two awards are available annually for freshmen who enroll in Electrical, or Mechanical Engineering, and associated fields. May be renewed if satisfactory progress is made.

SCHOLARSHIPS FOR UPPERCLASSMEN

Recipients of the following awards are normally selected by the scholarship committees in early spring for the following school year. Completed applications must be submitted not later than February 1, to insure consideration. (Also note that some few freshman scholarships are equally available for upperclassmen.)

Jerry B. Addy Memorial Scholarship. Income from a fund donated by his relatives and friends provides a renewable annual award to a rising junior majoring in Mathematics, Physics, or Chemistry. Priority is given to residents of South Carolina. Selection is based upon academic proficiency and financial need.

Allied Chemical Foundation Scholarships. Two $750 awards are given annually to upperclassmen majoring in a Textile curriculum.

G. Dewey Arndt Scholarship. Income from a fund donated by FCX, Inc., and Carolinas Cotton Growers Association, Inc., provides a renewable annual award to an upperclassman in the College of Agriculture and Biological Sciences with preference given to students with an indicated interest in marketing and economics. Selection is based upon need, academic achievement, leadership, and character.

Barney Lee Bickley Memorial Scholarship. Income from a fund donated by his relatives provides an annual award for a sophomore student. Priority is given to residents of South Carolina.

Borden Agricultural Scholarship. A $750 award is available annually for the rising senior in Agriculture who has achieved the highest scholastic average on all college work preceding the senior year.

Burlington Industries Scholarship. An award, with preference to students majoring in Textiles or Industrial Management is available each year. Normally awarded to rising juniors; may be renewed if need, scholarship, and leadership continue at levels considered appropriate.

The Carolina Yarn Association Scholarship. A $500 scholarship is awarded annually to an upperclassman majoring in Textiles.

The A. B. Carter, Incorporated, Scholarship. A $500 scholarship is awarded annually to an upperclassman majoring in Textiles.

Langdon Cheves Scholarship. Income from a fund donated by his family provides an annual $400 award for a male undergraduate whose permanent place of residence is within the Southeastern United States. Selection is based upon academic progress, financial need, and participation in extracurricular activities.

Coburg Dairy Scholarship. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually to a junior majoring in Dairy Science.

Selection is based upon scholarship, leadership, character, and financial need.

Gilbeart H. Collings Memorial Scholarship. An $800 award, given by the South Carolina Plant Food Educational Society and to be paid in equal installments during the last two years of satisfactory undergraduate study, is available each year for a rising junior majoring in Agronomy. Selection is based upon scholarship, leadership and character.

Cotton Producers Association Scholarship. A $900 award, to be paid in three equal installments during the sophomore, junior, and senior years, is available annually to a rising sophomore majoring in Agricultural Economics, Agricultural Education, Agricultural Engineering, Agronomy—Crops and Soils, Animal Science, Dairy Science, Entomology, Food Science, Horticulture (Fruit and Vegetable), or Poultry Science. Selection is based upon scholarship, leadership, character, and financial need.

Ethyl Corporation Scholarhip. A $500 award is available annually for a student majoring in Chemical Engineering. Selection is based upon scholastic ability and financial need.

Farm Credit Banks of Columbia Scholarships. Two $500 awards are available for juniors or seniors enrolled in the Agricultural Economics major or minor, the Business minor in any other agricultural major, or any equivalent undergraduate program in agriculture. Renewal subject to academic achievement. Selection based upon scholarship, leadership, character, and financial need.

Fieldcrest Scholarships. Fieldcrest Mills makes available annual scholarships (and, if desired, summer employment) to upperclassmen enrolled in specific curriculums pertinent to employment in the textile industry. Selection is based upon academic excellence, extracurricular activities, financial need, and willingness to consider a textile career.

W. T. Fort, Sr., Scholarship. A $500 award is available to rising seniors in Architecture or Building Construction. Selection is based primarily upon financial need.

Foundry Educational Foundation Scholarships. Funds made available by grants from the Foundation provide one or more annual awards to students taking organized programs applicable to the casting of metals and foundry technology.

Ben H. Gardner Fund. Income from a fund donated to the University is awarded annually to a worthy student in the College of Engineering.

Ben and Kitty Gossett Scholarship. Income from their contribution provides one or more annual awards for Textile students whose families are employed by the textile industry in South Carolina.

J. H. Griffin Memorial Scholarship. Income from the J. H. Griffin Memorial Scholarship fund provides an annual award for a rising male senior (legal resident of South Carolina) majoring in Animal Science. Selection is based upon scholarship, leadership, character, and financial need.

Pauline Hanckel Dairy Scholarship. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is provided annually by the Ladies Auxiliary of the South Carolina Dairy Association to be available to a junior majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Higgins Undergraduate Scholarships. Income from a fund donated by Mr. Higgins provides several annual awards for undergraduate students enrolled in the College of Engineering. Selection is based upon scholarship and need.

Richard O. Hull Scholarships. Two $500 awards are available annually for students majoring in Chemistry and Chemical Engineering who have achieved superior scholastic averages on all their college work. Selection is based primarily upon academic ability although financial need will also be taken into cognizance.

John D. Lane Scholarship. A $125 award is available each year for a rising junior. Selection is based upon financial need and scholastic ability with emphasis upon achievement in the field of English.

Monsanto Scholarship. A $500 award is available annually for a student majoring in Chemical Engineering.

Owens-Corning Fiberglas Scholarships. Two $500 awards (one in Ceramics) are available annually for rising juniors or seniors majoring in Engineering or Textiles. Selection is based upon academic ability, leadership qualities, and financial need.

Peace Fund Scholarship. A $500 award is available annually to a rising junior or senior. Selection is based upon journalistic ability, scholastic achievement, and evidence of good character.

Pennsylvania Glass Sand Scholarship. A tuition award is given annually to an outstanding rising senior majoring in Ceramic Engineering. Selection is based upon scholastic achievement.

Ralston Purina Scholarship. A $500 award is given annually to a rising senior enrolled in the College of Agriculture and Biological Sciences. Selection is based upon scholarship, leadership, character, extracurricular activities, sincerity of purpose in agriculture, and financial need.

Rayonier Scholarship. A $500 award is available annually for a rising senior majoring in Engineering. Selection is based upon academic standing and leadership ability.

J. C. Rich ('13) Agriculture Scholarship. Income from a fund donated by his sister provides an annual award for a deserving male undergraduate enrolled in the College of Agriculture and Biological Sciences. Preference is given relatives.

Seydel-Wooley & Company Scholarship. A $500 scholarship is available annually for a rising sophomore, junior, or senior male student majoring in the Textile Science or Textile Chemistry curriculum. Selection is based upon scholastic ability, evidence of leadership in school activities as a potential for leadership to the Southern Textile Industry.

The J. E. Sirrine Company Scholarship. A $500 scholarship is awarded to an outstanding undergraduate student in Civil Engineering, Chemical Engineering, Electrical Engineering, or Mechanical Engineering. This award is based upon a consideration of character, scholarship, and interest in a particular professional field. Preference is given to rising sophomores. Financial need is not a specific requirement.

Sonoco Products Scholarships. Two $500 awards are available annually for deserving undergraduates majoring in Textiles.

South Carolina Dairy Association Scholarships. A $1,000 award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually to a junior from South Carolina majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Charles H. Stone Scholarship. A $1,000 award is available annually to a rising sophomore. Selection is based primarily upon exceptional academic achievement plus financial need.

3-M Company Scholarships. Two $500 scholarships are awarded annually to students majoring in Engineering and one $500 scholarship is awarded annually to a student majoring in Chemical Engineering. Selection is based upon academic standing, character, and demonstrated leadership abilities.

UniRoyal Foundation Scholarships. An award, to be paid in equal installments during the last two years of satisfactory undergraduate study, is available annually for a rising junior planning a career in industry. Selection is based upon proven scholastic ability and financial need.

J. P. Williamson Memorial Grants. Income from a fund donated by his relatives and the Winn-Dixie Stores Foundation is available annually for renewable grants to academically qualified and needy upperclassmen. Grants must be matched by loans from one of the established programs with which the University is affiliated. Priority is given to residents of Anderson County.

LOAN FUNDS

General prerequisites for the following aid are enrollment, or acceptance for enrollment, as a full-time student, substantiated need, and adequate academic capability or potential to maintain at least average college-level grades. Applicants for other types of financial assistance may also be considered for loans after contacting the Financial Aid Office. Availability is dependent upon adequacy of funds at hand. Normal cutoff date for loan applications is June 1.

Georgianna Camp Foundation Fund. A fund, donated in memory of Georgianna Camp by her husband and sons, is available to assist worthy students who are seeking a college education and require assistance to supplement their individual efforts and available sources of income. (Alumni Foundation)

Clemson Architectural Foundation. Needy Architecture students in the upper years of their curriculum who show professional promise will be considered for loans from the General Fund of the Foundation.

Clemson Student Loans. A number of interested faculty and staff members, alumni, students, families, and friends have made memorial donations to assist worthy students.

Clemson University Foundation. A limited sum is available for emergency student loans. Included are donations from family and friends made in memory of J. C. Littlejohn ('08), J. H. Woodward, Jr. ('35), and his father, Uncle Jake ('02). (Alumni Foundation)

Daniel Memorial Fund. Income from a sum donated by officers of the Daniel Corporation in memory of James Fleming Daniel and Fred Adams Daniel is loaned to deserving students.

National Defense Student Loan Program. State and Federal monies are available to provide assistance to graduate and undergraduate students. Prerequisites are verified need and the demonstrated ability or potential to maintain normal and satisfactory academic progress. Normally restricted to those students planning careers in the teaching profession.

Nursing Student Loan Program. Under the Health Manpower Act of 1968, loans may be made available for full-time study in a School of Nursing. Pererequisites are verified need and the demonstrated ability to maintain substantial academic progress at the collegiate level.

Reid-Baskin Fund. Income from a fund donated in memory of Cecil L. Reid ('02) and John Baskin will be used to aid deserving students. Preference is given Newberry and York County residents. (Alumni Foundation)

Tile Council of America Fund. The Tile Council has made a grant to be used for interest-free loans to outstanding and needy students in the lower years of the Architecture curriculum.

United Student Aid Funds Loan Program. Clemson University is one of a large number of universities participating in this national nonprofit loan program for needy and deserving students. Full-time students may borrow up to $1,500 per year. Interest is 7% simple and payment of interest and principal begin the tenth month after graduation and may be anticipated. The financial aid officer recommends the loan, after consultation with the student, and the loan is negotiated at the student's home town bank on the student's own signature. This is the designated lending agency of the State of South Carolina. Under the provisions of the Higher Education Act of 1965, and depending upon family income, the U. S. Commissioner of Education may pay the interest on eligible loans while the student is in school.

STUDENT PART-TIME EMPLOYMENT

Clemson University employs students in those positions where part-time services may be utilized to mutual employment advantage. Students in actual need of financial aid are usually given preference in filling positions, all other qualifications being equal. Part-time employment of first-year students is not encouraged as the University has found through long experience that the period of academic adjustment during the freshman year allows little time for such extracurricular activity. The Student Financial Aid Office maintains application files of students desiring part-time employment for the information of requesting academic departments and off-campus agencies and industries interested in securing such help. Applications must be filed after registration for each semester during which part-time work is desired. Clemson does not participate in the Federal College Work Study Program.

OTHER SOURCES OF FINANCIAL AID

The following types of assistance are not administered by Clemson University. Recipients will be required to furnish the supporting agencies with a schedule of payments due the Bursar if payment is desired to be made through the University. Such funds must be received by him on or before the due dates. Any other arrangements require approval of the Bursar.

Army Student Nurse Program. Students in the baccalaureate program who participate in this program during the junior and senior years have tuition paid and a monthly salary of approximately $270. Six months prior to graduation the student is promoted to second lieutenant and salary increases to approximately $475 per month. Those participating for one year must agree to serve for two years in the ANC after graduation. Those in the program for 12-24 months agree to serve three years.

National and State Agencies. Students should investigate such sources of financial aid as the following: Veterans Education, War Orphans Education, advanced ROTC programs, National Guard and Reserve training programs, National Merit Scholarships, and grants made the handicapped through the State Department of Vocational Rehabilitation.

Other Agencies. Help is often received from grants or loans through: American Institute of Architects, Beta, FFA, and 4-H Club membership; local organizations of the Daughters of the American Revolution, United Daughters of the Confederacy, Civitan, Elks, Masonic, Rotary, and similar groups; James F. Byrnes Foundation, Pickett and Hatcher Educational Fund, Methodist Student Loan Foundation, Knights Templar Educational Foundation, The Agricultural Society of South Carolina, The Garden Club of South Carolina, South Carolina Agricultural Teachers Association, S. C. Nurserymen's Association, Institute of Food Technologists; and various other religious, civic, welfare, and educational agencies.

Industry and Related Foundation Support. Students are often able to finance part of their education by summer employment or by alternating semesters between the University and jobs with establishments near their homes. Some students are eligible for loans or grants which are administered by those corporate and local industries which employ their parents. The finest source of information regarding this type of support has been found to be high school counselors.

Miscellaneous. There are available a number of "deferred tuition" lending plans. Examples of these are Education Funds, Inc., Tuition Plan and College Aid Plan.

It should be realized that the University has no affiliation or contractual agreement with any of the agencies sponsoring such plans and can accept no responsibility for the outcome of any individual arrangements entered into with those agencies.

HONORS AND AWARDS

Recipients for the following awards are chosen for their special achievements by selection committees, and are announced at an annual Honors and Awards Day program in the spring or at other appropriate ceremonies during the year.

Air Force Association Award. The Air Force Association of Washington, D. C., awards this medal annually to the outstanding Aerospace Studies 400 cadet who has shown outstanding aptitude for both academic and military pursuits.

Air Force Times Award. Presented annually to one graduating cadet at each detachment who has distinguished himself in bringing constructive attention to the Air Force ROTC.

Daughters of the American Revolution Award. Presented annually to an outstanding Aerospace Studies 400 cadet.

The Alpha Rho Chi Medal. The Alpha Rho Chi fraternity annually awards a gold medal to the graduate of the professional curriculum in Architecture who has shown the greatest leadership, service to his school, and who gives promise of professional merit.

Alpha Tau Alpha Scholarship Medal. An annual award is given to the senior in Agricultural Education having the highest scholastic record.

Alpha Zeta Award. An annual award is given to a major in the College of Agriculture and Biological Sciences having a high scholastic record and possessing qualities of character and leadership.

Ambrosia Chocolate Award. An engraved watch is given annually by the Ambrosia Chocolate Company to the senior having the highest grade in Fd Sc 414.

American Agricultural Economics Association Award. This award is presented each year by the Clemson Student Chapter of the American Agricultural Economics Association to the outstanding student in Agricultural Economics, based on academic attainment and leadership in the club and other extracurricular activities.

American Association of Textile Chemists and Colorists Award. An annual award is given for the best work done in Textile Chemistry and Dyeing by a member of the graduating class.

American Association of Textile Technologists Award. An annual award is given to the graduate having a high scholastic record and all-round qualification for success in the textile industry.

American Association of University Women Award. The Clemson branch awards an engraved silver bowl annually to the girl graduating with the highest cumulative grade-point ratio.

American Chemical Society Award. An annual award is given to the outstanding senior in Chemistry who is a member of the student affiliate chapter of the American Chemical Society.

South Carolina Chapter, American Institute of Architects Award. The South Carolina Chapter of the American Institute of Architects each year awards a Certificate of Merit to the outstanding fourth-year student of Architecture in the Design Option and the Structural Option.

American Institute of Architects Medal. The National Organization of The American Institute of Architects awards each year a silver medal and a book to the outstanding graduate in the professional curriculum in Architecture at Clemson. An award is also presented to the runner-up.

American Institute of Chemical Engineers Award. The American Institute of Chemical Engineers sponsors an annual award to the junior majoring in Chemical Engineering who has attained the highest scholastic standing through the sophomore year.

Institute of Electrical and Electronics Engineers Scholastic Award. An annual award is given for outstanding participation in the Student Branch activities of IEEE to a second-semester junior or the first-semester senior having high scholastic standing.

American Legion ROTC General Military Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Air Force ROTC cadet who has demonstrated outstanding qualities in military leadership, discipline, character and citizenship.

American Legion ROTC General Military Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Army ROTC cadet who has demonstrated outstanding qualities in military leadership, discipline, character and citizenship.

American Legion Scholastic Excellence Award. The American Legion annually awards a medal to an outstanding junior and senior Army ROTC cadet based on scholastic achievement, participation in student activities and demonstrated leadership.

American Society of Agronomy Award. The American Society of Agronomy sponsors an annual award to an outstanding senior in the Department of Agronomy and Soils.

American Society of Civil Engineers Membership Award. The South Carolina Section of the American Society of Civil Engineers sponsors an annual award to the outstanding graduating senior in Civil Engineering.

The American Society of Mechanical Engineers Award. An annual award is given to a senior in Mechanical Engineering for his outstanding service in the College of Engineering.

Society of American Military Engineers Award. The Society of American Military Engineers awards annually a gold medal with key replica to the twenty outstanding AFROTC cadet juniors and to the twenty outstanding AFROTC cadet seniors enrolled in Aerospace Studies in colleges and universities throughout the nation who are majoring in Engineering.

Society of American Military Engineers Award. The society of American Military Engineers awards annually a gold medal with key replica to the twenty outstanding Army ROTC cadet juniors and to the twenty outstanding Army ROTC cadet seniors enrolled in the Army General Military Science ROTC Units in colleges and universities throughout the nation who are majoring in Engineering.

Major Rudolf Anderson, Jr., Trophy. The trophy is presented annually to the Aerospace Studies cadet who has distinguished himself by his performance and dedication to the precepts of the AFROTC Cadet Wing at Clemson University, such actions having been acknowledged to constitute the most outstanding contribution to the promotion and enhancement of the traditions, ideals, and aspirations of the Air Force Reserve Officer's Training Corps.

Architectural Faculty Award. The faculty of the College of Architecture has established this award for recognition of academic excellence of a first-year Pre-architecture student.

Armed Forces Communication and Electronics Association Gold Medal. The Armed Forces Communications and Electronics Association of Washington, D. C., sponsors an annual award to the outstanding senior Army ROTC cadet majoring in Electrical Engineering.

The Armed Forces Communication and Electronics Association Award. An annual award is given to the outstanding AFROTC senior majoring in mathematics, chemistry, or engineering who has demonstrated outstanding qualities of military leadership, character, and definite aptitude for military service.

South Carolina Chapter, Armed Forces Communications and Electronics Association Leadership Award. An annual award is presented to an outstanding ROTC junior majoring in Electrical Engineering. The award includes a one-year membership in the Association and a subscription to *Signal* magazine.

Associated Schools of Construction Award. A book is given in the name of the Associated Schools of Construction to a student in Building Construction for scholarship and for his having demonstrated promise of future achievement in his chosen field.

Association of the United States Army Award for Excellence in Military History. The Association of the United States Army annually sponsors an award to the second-year Army ROTC cadet achieving the highest average in Military History.

Association of the United States Army ROTC Award. The Association of the United States Army annually awards a medal to each of four junior ROTC cadets who are in the top 10 percent in ROTC grades and in the top 25 percent in general academic grades and who have contributed most, through leadership, to advancing the standing of the Army ROTC unit and the Military Science Department at Clemson University.

G. H. Aull Essay Award. A $25 award is given annually to the senior student presenting the best essay in the field of Agricultural Economics.

Block and Bridle Club Scholarship. A $100 award to be paid at the beginning of each regular semester is available to a junior in the Block and Bridle Club. Selection is based on scholastic ability, financial need and leadership in the club and other activities.

Chemistry Faculty Award. An annual award is given to the sophomore majoring in Chemistry who maintained the highest scholastic record in Chemistry during his first two semesters of work.

Class of 1902 Awards. The members of the Class of 1902 have deposited with the Clemson University Foundation three funds of $2,000 each, in recognition of the distinguished teaching services of three professors who were on the faculty at that time, and in memory of those of the class who have passed on. The income from these funds is to be awarded annually as follows: *The Williston Wightman Klugh Award,* to a worthy, earnest undergraduate student of good moral code and personality who intends to make teaching his life work; *The Rudolph Edward Lee Award,* to a worthy undergraduate student in Architecture, upon the recommendation of the faculty of that College after consideration of the student's grades, extracurricular activities, and those qualities that go toward making a successful professional architect; and *The Samuel Maner Martin Award,* to a worthy undergraduate student taking mathematics as a major subject.

Commander's Saber. Presented annually by the Professor of Military Science to the Army ROTC cadet officer considered to have contributed most to the advancement of the cadet brigade through leadership and devotion to duty.

Howard Carlisle Copeland Memorial Award. The family of Howard Carlisle Copeland, who gave his life during World War II, has set up a permanent memorial fund in his memory. Each year the interest from the fund shall be given to the boy who has made the greatest endeavor financially to stay in college.

The H. William Close Achievement Award of the Textile Veterans Association. A medallion and a $100 U. S. Savings Bond is awarded annually to the most outstanding senior in either the Textile Chemistry or Textile curriculum in honor of Mr. H. William Close, President of Springs Mills, Incorporated.

The Marvin R. Cross Honor Award of the Textile Veterans Association. A $50 U. S. Savings Bond and a medallion is awarded annually to an outstanding senior in the Textile Department of the College of Industrial Management and Textile Science.

Danforth Fellowships. The Danforth Foundation of St. Louis awards two fellowships each year to agricultural students. One of these is given to an outstanding member of the junior class majoring in either Agricultural Economics, Agricultural Education, Animal Science, Dairy Science or Poultry Science, and provides for a 2-week summer short course with Ralston Purina Company, and a 2-week stay at the American Youth Foundation Leadership Training Camp at Shelby, Michigan. The second award provides for a 2-week stay at the Leadership Camp at Shelby, Michigan, and is awarded to an outstanding freshman in the College of Agriculture and Biological Sciences.

Distinguished Military Student Badge. An annual award is given by the Department of the Army to those individuals, designated by the Professor of Military Science, who possess outstanding qualities of leadership, high moral character, and definite aptitude for Army service. They must have attained an academic standing in the upper half of their class and demonstrated leadership ability through their achievements while participating in recognized campus activities. Such recognition carries with it the opportunity for commissioning in the Regular Army.

Samuel B. Earle Award. An award established by Clemson Alumni in honor of Dean Samuel B. Earle, who ended 48 years of service to Clemson University in July, 1950, is given annually to an outstanding senior in the College of Engineering.

Lena Brayton Eaton—Carrie Hutchins Freeman Award. An annual award made by the Department of Music to an undergraduate of Clemson University who is the winner of a competition consisting of the performance on the piano of a composition of serious music. The award honors two persons who contributed greatly to a deeper appreciation of music in the Clemson community and in the University where their husbands were members of the faculty.

Dr. R. C. Edwards Award. Awarded annually to the outstanding Clemson University Army ROTC cadet who attained the highest degree of proficiency during the preceding ROTC summer camp.

English Honor Key. This key is awarded annually to a student in the graduating class who has an outstanding record in English as an undergraduate at the University.

South Carolina Entomological Society Award. An annual award is given to an undergraduate student majoring in Entomology. Selection will be made on the basis of scholarship and character.

The Faculty Award of the College of Industrial Management and Textile Science. A gold medallion and a U. S. Savings Bond is awarded annually to the most outstanding graduating senior in the College.

Faculty Scholarship Award. An annual award is given to the member of the graduating class with the highest academic achievement by the academic faculty. The winner receives a certificate and a gold medal and has his name inscribed upon a plaque which is placed in the main entrance of Tillman Hall. This plaque carries the names of all previous winners of the award.

Forbes Chocolate Award. A $100 award is available annually to a sophomore majoring in Dairy Science. Selection is based upon scholarship, leadership, character, and financial need.

Forestry Junior Scholar Award. An award of $50 is presented to the junior in Forestry having the highest academic record. The award is made possible by contributions from certain wood-using industries and from the South Carolina Society of Consulting Foresters.

Gamma Sigma Delta Awards. Awarded annually to the student in the sophomore class and in the senior class majoring in Agriculture and having the highest scholastic attainment.

Ben H. Gardener Award. The income from a fund donated to the University by the father and son is given annually to some worthy and needy student in the College of Engineering.

General Dynamics Award. An annual award is given to the most outstanding sophomore student of the basic AFROTC course who is qualified and motivated for an Air Force career.

J. H. Griffin Memorial Scholarship. Income from the J. H. Griffin Memorial Scholarship Fund provides for an annual award to a rising male senior (legal resident of South Carolina) majoring in Animal Science. Selection is based upon scholarship, leadership, character, and financial need.

Industrial Management Merit Award. An award is provided by the Neely and Gibson Coal Sales Company (William J. Neely, '32, and Harry H. Gibson, '32) for an Industrial Management major who has demonstrated through outstanding academic performance and excellent personal characteristics sufficient potential to enable him to assume significant managerial responsibilities in modern industry.

Harrison Freeman Lathrop Award for Scholarship. An award in honor of Mr. Harrison Freeman Lathrop, an outstanding forester of South Carolina, provided by the South Carolina Tree Farm Committee and by Mr. Oswald Lightsey, of Hampton. The award, consisting of $100 and an engraved plaque, is given to a Forestry senior selected by the faculty of the Department of Forestry on the basis of scholarship, leadership, and personality.

Rudolph E. Lee Award. In recognition of the distinguished teaching service of Rudolph Edward Lee and in memory of those of the class who have passed on, the members of the Class of 1902 present each year the Rudolph Edward Lee Award of $100 to a worthy undergraduate student in Architecture, after consideration of his grades, extracurricular activities, and those qualities that go toward making a successful professional architect.

James Lynah Merit Awards. Income for several awards is derived from a fund established by Mr. James Lynah, in memory of distinguished professors who were teaching at Clemson when the Class of 1902 were undergraduates, as follows: *The Charles Manning Furman Prize* in English, *The Mark Bernard Hardin Prize* in Chemistry, *The William Shannon Morrison Prize* in History, *The Charles Carter Newman Prize* in Horticulture, *The Walter Merritt Riggs Prize* in Electrical Engineering and *The Augustus G. Shanklin Prizes* in ROTC, Air and Military Science and Tactics. These awards are made to students having a high scholastic rating and possessing outstanding qualities of character and leadership.

Clark Lindsay McCaslan Award. A sum of money has been deposited with the University to establish a fund in memory of Clark Lindsay McCaslan, Class of 1908, and a pioneer in Agricultural Engineering. The income from the fund shall be given annually to the student in the Department of Agricultural Engineering who in the opinion of the faculty shall be deemed to be the most deserving.

Colonel S. T. McDowell Award. Awarded annually to the outstanding Army ROTC cadet senior scheduled to be commissioned in a Combat Arm of the United States Army.

Henry T. Malone Gamma Alpha Mu Award. Henry T. Malone, Class of 1937, will present a $50 award to the undergraduate student who writes the best feature on campus, community, or state history to appear in *The Tiger.*

Marksmanship Awards. Medals are annually presented to those members of the Army ROTC Rifle Team achieving highest position average scores.

Martin Instrument Company Award. A $50 award to the senior student majoring in one of the biological sciences who achieves the highest scholastic record.

Dr. Ralph Mershon Memorial Award. The Secretary of the Army will present annually a $250 prize to the outstanding Distinguished Military Graduate of a senior division Army ROTC university or college who is commissioned in the Regular Army.

National Defense Transportation Association Award. This award may be presented annually to an outstanding Aerospace Studies 400 cadet majoring in Industrial Management.

Northern Textile Association Honor Award. A medallion is awarded annually to the graduating senior in the Textile curriculum with the highest scholastic average in the Textile curriculum.

National Defense Transportation Association Award. The National Defense Transportation Association will award annually the NDTA Medal to the twenty outstanding senior students enrolled in General Military Science Army ROTC units throughout the nation.

Thomas Newcomen Award in Material History. The Newcomen Society in North America gives an annual award for the best research paper presented in the field of Material History.

Norris Medal. The following is from the will of the Hon. D. K. Norris, a life trustee of Clemson, who died in 1905:

"I give $500.00 face value, Norris Cotton Mill stock . . . on condition the dividend thereon shall be applied annually to the purchase of a gold medal, to be known as the 'Norris Medal,' to be awarded to the student of Clemson meriting the same at graduation, under such rules and conditions as may be prescribed by the said Board of Trustees, and which medal shall have engraved on it '*Honor habet onus*' (Honor brings responsibility)."

The winner of the Norris Medal has his name inscribed upon a plaque which is placed in the main entrance of Tillman Hall. This plaque carries the names of all previous winners of the Norris Medal since it was first awarded in 1908.

American Ordnance Association Gold Scholarship Key. The American Ordnance Association, Washington, D. C., sponsors annually an award to the senior Army ROTC cadet with the most ability in the ordnance field to be commissioned to the Ordnance Corps.

Outstanding Cadet Non-Commissioned Officer Award. An annual award of the Department of Military Science presented to the Outstanding Army ROTC Cadet NCO based on exhibited improvement in all aspects of military performance.

Willie N. and Joe Wise Padget Scholarship. The income from a fund donated to the University by members of their family is used annually to aid a deserving student from Saluda County.

Phi Eta Sigma English Award. An annual award is given to a freshman scoring highest on a competitive examination in English.

Phi Eta Sigma Mathematics Award. An annual award is given to a freshman scoring highest on a competitive examination in mathematics.

Phi Eta Sigma Scholarship Medal. An annual award is given to the senior having the highest scholastic record.

Phi Kappa Phi Award. An annual award is given to the junior having the highest scholastic record.

Phi Psi Award. This award is made annually by the National Honor Council of the Phi Psi Textile Fraternity to an outstanding graduating senior in either the Textile Chemistry or Textile curriculum, considering scholastic record, leadership ability, and other qualities.

Physics Faculty Awards. An annual award of $50 is given to the outstanding sophomore majoring in Physics, and an annual award of $100 is given to the outstanding junior majoring in Physics.

Piedmont Engineers and Architects Award. An annual cash award to the sophomore majoring in Civil Engineering who has the highest scholastic record during his first three semesters of work.

Pomona Pipe Products Award. A cash award is made to the member of the junior class in Civil Engineering with the most outstanding academic record.

Quartermaster Association Awards. The Quartermaster Association annually awards a medal to the ten outstanding junior students and a scholastic key to the ten outstanding senior students enrolled in the Army General Military Science ROTC program in colleges and universities throughout the nation. Students must be enrolled in courses including as a major item of curriculum at least one educational area of particular interest to the Quartermaster Corps.

Reserve Officers Association Award. Awarded annually to an AFROTC sophomore, junior, and senior cadet, based on scholastic and Aerospace Studies grades, and leadership qualities.

Reserve Officers Association Medal. The South Carolina Department of the Reserve Officers Association sponsors an annual award to the outstanding Army ROTC Cadet in each of the four academic years.

The Harry Riemer Honor Award of the Textile Veterans Association. A medallion and a $25 U. S. Savings Bond is awarded to a member of the graduating class who has the potential to make an outstanding contribution to the textile industry in future years.

Scientific Products Award. A $25 award to the freshman student majoring in one of the biological sciences who achieves the highest scholastic record.

Sigma Pi Sigma Award. An annual award is given to the outstanding senior in the Physics Department.

Sigma Tau Epsilon Award. An annual award is given to the senior majoring in the College of Liberal Arts or the College of Physical and Mathematical Sciences and having the highest scholastic record.

R. W. Simpson Medal. A medal designated as the "R. W. Simpson Medal" is awarded annually to the best drilled Army ROTC cadet in each of the freshman, sophomore, or junior classes.

The Solite Award. The Southern Lightweight Aggregate Company annually makes a grant of $1,000 to the Clemson Architectural

Foundation, a portion of which is used for prizes for those fifth-year professional theses adjudged to be outstanding.

Sons of the American Revolution Medal. An annual award is given to a freshman AFROTC cadet who is outstanding in academic courses, Aerospace Studies, and leadership characteristics.

The South Carolina Masonry Association Award. The South Carolina Masonry Association annually makes a grant of $600 to the Clemson Architectural Foundation, a portion of which is used for awards in an intermediate-level architectural design problem.

South Carolina Society of Sons of American Revolution Medal. An annual award is given to an Army ROTC cadet who exhibits a high degree of merit with respect to leadership, soldierly bearing and excellence in theoretical courses of study.

The Southern Brick and Tile Award. The Southern Brick and Tile Association annually makes a grant of $100 for prizes awarded in an advanced-level architectural design problem.

Algernon Sydney Sullivan Medallion. A valuable and artistic memorial, established by the Southern Society of New York in honor of its first president, is awarded each year by the University to a member of the graduating class and to one other person who has some interest in, association with, or relation to the institution, official or otherwise, of a nature as to make this form of recognition appropriate. The recipients of this award shall be chosen in recognition of their influence for good, their excellence in maintaining high ideals of living, their spiritual qualities, and their generous and disinterested service to others.

Superior Cadet Ribbon Awards. The Department of the Army awards annually Superior Cadet Ribbons to those Army ROTC students in each academic year (class) adjudged the most outstanding in their class.

Third Army Certificate of Meritorious Leadership Achievement. An award is given annually by the Commanding General of Third Army to the outstanding cadet on the basis of leadership development throughout the ROTC career.

Tau Beta Pi Scholastic Award. An annual award is given to the sophomore in Engineering having the highest scholastic record.

Trustees' Medal. The Board of Trustees has provided for a gold medal to be awarded annually to the best speaker in the student body.

Virginia Dare Award. An award of $25 is given annually by the Virginia Dare Extract Company, Incorporated, to the senior majoring in Dairy Science and having the highest grade in Dy Sc 402, Dairy Manufactures.

Wall Street Journal Student Achievement Awards. These annual awards are given to the most outstanding senior with a concentration in Agricultural Economics, College of Agriculture and Biological Sciences, and Economics, in the College of Industrial Management and Textile Science.

Harvey J. Wheeler Award. An annual award is given to the senior majoring in Economics and having the highest scholastic record.

Wyandotte Award. The Wyandotte Chemicals Corporation Trophy is awarded to the senior in Dairy Science having the highest grades in Dy Sc 409 and 410.

GUIDANCE SERVICES

Guidance has an important role at all levels of education and particularly so during times of transition and articulation. To assist students in this period of emotional and academic adjustment, an orientation and counseling program has been established.

At the beginning of his university career, each student is assigned to a faculty adviser selected from his academic school. The faculty advisers provide information on courses of study, approve class schedules, interpret academic regulations, and suggest adjustments in making satisfactory progress toward graduation.

The residence hall program is organized to cope with personal problems and questions regarding procedures and policies of college life. Residence hall counselors and supervisors are primarily concerned with maintaining an environment compatible to serious study and with the educational potential of group living.

COUNSELING SERVICES

Counseling Services are located in Tillman Hall. These services are available free of charge to all registered students and spouses of registered students. These services are oriented to early identification of and assistance with academic, vocational, personal, and psychological problems. Testing facilities of a vocational and psychological nature are available. Students are encouraged to take advantage of the individual services of a Counseling Psychologist, a Counselor, and of the Psychometric Services.

The service is dedicated to helping students in self-understanding, self-improvement, and in the attaining of academic and vocational goals. The aims of the service are preventive rather than curative.

PLACEMENT SERVICES

The University is glad to assist all who ask for help in securing summer or permanent employment; it does not assure positions for those who complete any of the courses of study.

The Placement Office coordinates and plans campus interview visits requested by representatives seeking graduates for positions with business, industry, and public service. It maintains current files of reported job opportunities and of alumni who wish to learn of available openings.

A Placement Bulletin is prepared periodically for distribution on the campus and for mailing to alumni upon request. It announces scheduled campus interviews and lists specific openings which may be of interest to students and alumni.

BUILDINGS AND GROUNDS

Change, challenge, and continuity are embodied in the architecture and landscape of Clemson University. The campus skyline is constantly changing, reflecting the new demands of the institution as it moves into the decade of the 70's and beyond.

While the challenges of the future—solving problems like environmental pollution—are symbolized by such buildings as the impressive new $2.4-million Rhodes Engineering Research Center (dedicated primarily to environmental and biomedical research), Clemson's long, rich tradition of education, scientific research and public service is brought to mind by historic structures like the Tillman Hall tower, focal point of the campus, whose cornerstone was laid in 1891.

The campus proper consists of 600 acres and represents an investment of approximately $70 million in academic buildings, student housing, service facilities and equipment. Basically, this is the site of Thomas Green Clemson's plantation, willed to South Carolina in 1888 for the establishment of the University. Fort Hill, former home of both Mr. Clemson and his father-in-law, John C. Calhoun, has been preserved at the center of the campus as a national shrine.

Beyond the main campus, stretching into Oconee, Pickens, and Anderson counties, are another 24,000 acres of farm and agricultural and forestry research lands. Throughout the state are 6,800 more acres devoted to Agricultural Experiment Station research and 4-H Club activities.

The University's $60 million building program to meet projected needs of a 10,000 student body by 1975 is over 25 percent complete. More than $32 million in new construction was added to the campus during the decade of the sixties.

One of the central features of campus development, the Robert Muldrow Cooper Library, was completed in 1966. This beautiful structure houses some 430,000 volumes and is the permanent home of papers and souvenirs belonging to both the Honorable James F. Byrnes and State Senator Edgar A. Brown, as well as valuable collections of papers and letters of John C. Calhoun and other famous South Carolina statesmen.

Other new facilities completed under the current building program are three high-rise residence halls which currently hold 1,296 students, a 34-bed hospital and out-patient clinic, an east campus cafeteria, an arts and sciences classroom building and 10-story faculty office tower, and the multi-purpose J. C. Littlejohn Coliseum, which seats 10,500 people for basketball games and 12,000 for speaking engagements, concerts and other functions.

Teaching and laboratory facilities of the College of Agriculture and Biological Sciences are housed in the R. F. Poole Agricultural Center complex. Another grouping serves the College of Engineering, including Olin Hall for Ceramic Engineering and Earle Hall for Chemical Engineering. These two buildings and their excellent equipment represent gifts from the Olin Foundation totaling nearly two million dollars.

Sirrine Hall is the home of the College of Industrial Management and Textile Science, where government and industrial cotton fiber testing laboratories are located. The College of Architecture is located in the modern, well-equipped Lee Hall. Other groupings of classrooms and laboratories serve the College of Education, the College of Liberal Arts, the College of Physical and Mathematical Sciences, and the School of Nursing.

The current building program includes plans for construction of a $6 million University union and related facilities, a new building to house the recently established College of Forest and Recreation Resources, a biological sciences building, and a $2.1 million addition to the College of Architecture.

The University's 16 residence halls for men and women accommodate nearly 5,200 students. One hundred and fifty individual units and apartments provide living accommodations for another 289 married students.

Ten of the residence halls, with 2,244 students, are fully carpeted; there are telephones in 1,405 student rooms.

The University-owned Clemson House Hotel, with its 184 rooms and apartments, together with 112 faculty and staff housing units provides excellent community hotel facilities and permanent housing.

RESERVE OFFICERS' TRAINING CORPS (ROTC)

The Department of the Army and the Department of the Air Force both maintain ROTC units at Clemson University. The mission of the Reserve Officers' Training Corps is to produce officers having qualities of leadership and attributes essential to their progress and continued development as commissioned officers in either the Army or the Air Force of the United States. A four-year program, consisting of the basic course for freshmen and sophomores and the advanced courses for juniors and seniors, is offered by both services.

To enroll in basic ROTC, students must be at least 14 years of age and citizens of the United States at the time of entrance. They must be of good moral character and must sign a loyalty certificate. They must not be physically disqualified to the extent that drill would further aggravate the physical defect. Air Force candidates will be administered a written Air Force Officer Qualification Test and a physical examination during their freshman or sophomore year to determine eligibility for the advanced AFROTC course, and interested Army candidates will be administered a written Army Officer Qualification Test and a physical examination during their sophomore year to determine eligibility for advanced Army ROTC. Foreign students may enroll in the ROTC program provided they sign a statement of intention to become American citizens or receive the approval of their government.

Students enrolled in the advanced course are paid $50 per month, including one summer vacation. Pay while attending summer camp is computed differently and is considerably higher. Members of the advanced course are required to attend one summer camp before commissioning.

Students who have six months or more active military service and students who have successfully completed two or more years of ROTC training at the high school level may substitute such service and preparatory schooling for all or part of the Clemson basic ROTC course. Students in either of these categories should consult with the Head of the Military Science or Aerospace Studies Department concerning accreditation.

Students who complete the prescribed ROTC courses and receive a bachelor's degree may be awarded commissions in either Regular or Reserve components of the Army or Air Force. Students who complete the basic course may receive 4 semester credit hours of elective credit; those selected for Advanced ROTC may substitute Aerospace Studies or Military Science courses for an additional 6 semester hours' credit.

Uniforms are provided to ROTC students. The University requires a deposit of $25 from each basic student. This is refundable when the uniform is turned in, provided there is no damage to the uniform other than normal wear. Each advanced ROTC student is credited with a uniform allowance, paid by the Government to the University, which is used by the University to purchase officer-type uniforms for use during the junior and senior years. The uniform becomes the property of the student when he is commissioned.

AIR FORCE ROTC

The Air Force ROTC program provides for selected students an education vital to the career of a professional Air Force officer. Commissions in the United States Air Force are awarded to male and female students who qualify for enrollment and successfully complete the program.

The four-year program consists of the General Military Course (GMC) or basic course and the Professional Officer Course (POC). During the second year of the GMC, a cadet may apply for admission into the POC.

Cadets who enter in the POC under the four-year program attend a four-week training period at an Air Force base during one summer following either their sophomore or junior year. This provides exposure to an Air Force environment which is beneficial in preparing cadets for future management positions.

The two-year program consists of a six-week preparatory training period, at an Air Force base during the summer between the student's sophomore and junior years, and the POC. The six-week preparatory period eliminates the requirement for completion of the GMC and training at an Air Force base while enrolled in the

POC. Applicants for the two-year program must meet all eligibility requirements for POC enrollment.

To be eligible for enrollment in the POC a cadet must: (1) Make application. (2) Pass the Air Force Officer's Qualification Test. (3) Pass the Air Force physical examination. (4) Meet citizenship, age, and loyalty requirements. (5) Possess leadership ability and good moral character. (6) Successfully complete two academic years of the GMC or have received credit for its equivalent. (7) Enlist in the Air Force Reserve (Obligated Reserve Section) AFROTC. (8) Have two academic years remaining (including graduate study) at Clemson University at the time of entrance. (9) Be enrolled as a full-time student. (10) Have attained the academic standards required by the University and the Air Force. (11) Be selected by a board of Air Force officers.

Male POC cadets who intend to become Air Force pilots participate in the Flight Instruction Program (FIP) during their senior year. They receive, at Government expense, pilot training conducted by a civilian contract flying school. Students who are not qualified or do not desire pilot training may be considered for entry into the POC as candidates for navigator training or officer duty in nonflying categories.

AFROTC students who have demonstrated outstanding leadership and academic qualities may be designated distinguished cadets at the beginning of their senior year. Clemson's distinguished cadets are eligible to compete with distinguished cadets from other institutions for regular Air Force commissions which are awarded upon graduation from the University.

AFROTC provides scholarships to highly qualified AFROTC cadets each year. Each scholarship pays tuition, fees, and $75 per academic year for books, in addition to $50 per month to the recipient.

The Air Force offers outstanding opportunities for an AFROTC graduate to pursue studies leading to an advanced degree. The educational delay program allows an AFROTC graduate to have his call to active duty delayed until he receives his advanced degree.

The Air Force Institute of Technology (AFIT) offers graduate programs in scientific, technical, and other professional fields. These programs are conducted at the AFIT resident school, Wright Patterson AFB, Ohio, at selected civilian institutions, and through training-with-industries programs. AFROTC graduates are eligible to apply for AFIT schooling after they are called to active duty.

Air Force officers receive full pay and allowances while attending school under the AFIT program.

ARMY ROTC

The Army ROTC instruction stresses an academic college-level program in content, scope, and intensity. Emphasis is placed on the development of the student's leadership, bearing, discipline, judgment and sportsmanship which will be a distinct asset in any profession that he may choose, military or civilian.

The General Military Science Program is conducted at Clemson (see Part V of this catalog for a description of courses). The program consists of a Basic Course for freshmen and sophomores and the Advanced Program for juniors and seniors. A student who has successfully completed the basic course, who meets the physical requirements, who has earned sufficient academic credits to be designated as an academic junior, and who is recommended by his instructors, may enter the Advanced Course offered during the junior and senior years. Successful completion of the Advanced Program qualifies the student for a regular or reserve commission in any of the arms or services of the United States Army.

Scholarship Program. Scholarships are available to selected ROTC students who are strongly motivated toward a career in the Army. Each scholarship pays for tuition, books and laboratory expenses, and, in addition, pays $50 a month for the duration of the award, except during the Advanced Course summer training camp at the end of the junior year when the pay is at the rate of $151.95 per month. Only students who participate in the four-year program are eligible. For further information concerning the scholarship program, contact the Office of the Professor of Military Science.

The requirements for formal enrollment in the Advanced ROTC Program are as follows:

Junior Year. Must have successfully completed all previous Military Science courses, have acquired a passing grade on a general intelligence test which is administered during the sophomore year, be physically qualified, and must have acquired the credits, a grade-point ratio of 2.0 and be designated an academic junior. The number of credits required for participation in the Advanced Course complements the academic requirements of the University and insures that the cadet receives his commission and his diploma simultaneously.

Senior Year. Must have successfully completed all previous Military Science courses and have attended summer camp, must be an academic senior, and have the cumulative grade-point ratio required for graduation.

Exceptions, where warranted, to the above general rules may be made by the Head of the Military Science Department.

During the four years of general military instruction, students will have the opportunity to indicate their preference for assignment to a particular branch. Final assignment authority remains with the Department of the Army and will be dependent upon such factors as the student's major academic course, class standing, qualities of leadership, the requirements and existing vacancies in the various branches of the Army, in addition to the student's choice.

Outstanding Army ROTC cadets who attain grades in the upper half of the class in academic subjects and the upper third in Military Science subjects during their junior year and who possess outstanding qualities of leadership, character and aptitude for military service may, with the approval of the University President, be designated as Distinguished Military Students by the Head of the Military Science Department. Those who maintain this outstanding record during their senior year may be designated Distinguished Military Graduates. A Distinguished Military Student may apply for appointment as a Second Lieutenant in the Regular Army.

Flight Training Program. An Army ROTC student in his fourth year of Military Science, or having completed his fourth year of Military Science, but not completed his academic requirements for graduation, may enroll in the Army ROTC Flight Training Program. If accepted, the student will receive 35 hours of ground school and 36½ hours of flight training at Government expense, after which the student may qualify for his FAA license and be recommended for further flight training upon entry on active duty. To be accepted in the Flight Training Program the candidate must agree that if commissioned at time of graduation, he will volunteer for Army Aviation Flight Training and assignment, and to serve on active duty as a commissioned officer for not less than three consecutive years from the date of completion of the Army Aviation Flight Training Course, in addition to meeting other physical and mental requirements.

ROTC students receiving commissions in the Regular Army or Army Reserve have the opportunity to apply for graduate school.

If accepted by the Army, applicant may be allowed to delay entry upon active duty to complete graduate study.

The student who receives his commission through Army ROTC is appointed in the Army Reserve as a Second Lieutenant and called to active duty for 2 years. Graduates of the program who enter active duty for 2 years will acquire a 6-year military obligation, only 3 of which would be in the Ready Reserve.

A recapitulation of Army service obligation is listed below:

	Reserve Officers	*Regular Army*	*Reserve Flight Training Officers*
Active Duty	2 years	3 years	4 years (Approx.)
Ready Reserve	3 years	2 years	1 year
Standby Reserve	1 year	1 year	1 year

ROTC Requirement. For those students who matriculate initially at Clemson after the spring semester 1970, ROTC will no longer be a requirement for graduation. In order to resolve the requirements and status of students matriculating prior to the end of the spring semester 1970, the following requirements apply:

To be eligible for graduation all male students not otherwise exempted whose initial matriculation in Clemson University was:

(1) On or before August 29, 1968, must complete four semesters of ROTC courses.

(2) After August 29, 1968, but prior to January 17, 1969, must complete three semesters of ROTC courses.

(3) After January 16, 1969, but prior to January 5, 1970, must complete two semesters of ROTC courses.

(4) After January 4, 1970, but prior to May 9, 1970, must complete one semester of an ROTC course.

(5) After May 9, 1970, ROTC courses are not a requirement for graduation.

HISTORICAL STATEMENT

It was the fall of the year and likely one of those blustery days as the horsedrawn carriage slowly rolled to a stop on a Pendleton road in 1886.

The driver, a tall, distinguished-looking man in his late seventies, peered from the carriage as if looking for someone he knew. Soon, another aged man approached the carriage, exchanged greetings with the first, and the two men—Thomas Green Clemson and Senator Benjamin Ryan Tillman—drove away together toward historic Fort Hill, a plantation some four miles away and the former homestead of John C. Calhoun, Clemson's late father-in-law.

Mr. Clemson had invited Senator Tillman to his home to discuss their mutual conviction that South Carolina needed a separate college devoted to industrial and scientific education. At Fort Hill, they met with Col. D. K. Norris and Col. R. W. Simpson. There the four "spent nearly the whole day in talking over the new project which Mr. Clemson had in mind and which he unfolded to us," Tillman later wrote.

Perhaps the most significant result of this conference was Mr. Clemson's decision to change a will he had made three years earlier and to execute a new will so as to serve better the great purpose which he had had in mind for many years.

Although his will of 1883 sought to provide for establishment of a scientific institution upon the Fort Hill place, Mr. Clemson later decided that his intention and purpose as stated in that will may be misunderstood.

In his new will, executed Nov. 6, 1886, Mr. Clemson wrote that he desired to make his purpose plain and to make some other changes in the disposition of his property. He clearly explained the nature and purpose of his proposed institution, the establishment of which "is now the one great desire of my life."

"It should afford thorough instruction in agriculture and the natural sciences connected therewith; it should combine, if practicable, physical and intellectual education, and should be a high seminary of learning in which the graduate of the common schools can commence, pursue and finish the course of studies terminating in thorough, theoretic and practical instruction . . ."

The first item of the new will concerned disposition of the 814 acres of the Fort Hill place and was largely taken from the 1883 will.

The will gave to the state all that part of the Fort Hill Estate inherited by Mrs. Clemson (the former Anna Maria Calhoun who died in 1875, 13 years before her husband) from her mother and the bulk of Mr. Clemson's other real and personal property. The latter amounted to a sum, which, considering the purchasing power at the time, probably has been only a few times exceeded in a public benefaction in South Carolina.

Mr. Clemson's will also provided for a seven-member Board of Trustees that would govern and manage the new institution. Named were: Cols. Simpson and Norris, M. L. Donaldson, R. E. Bowen,

B. R. Tillman, J. E. Wannamaker, and J. E. Bradley, who with those chosen by the General Assembly, would constitute a governing board if the state accepted the bequest; but, who, in the event the state declined the bequest, would alone constitute a governing board for a private institution.

These seven trustees, along with other friends of the movement and the agricultural groups in the state, developed and organized a public opinion favorable to the plan.

In November, 1889, the South Carolina General Assembly accepted the terms of Mr. Clemson's will and following the decision of the U. S. Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas G. Clemson into the reality of Clemson College.

The institution formally opened in July, 1893, with an enrollment of 446 students. The first graduating exercises were held in December, 1896, with a graduating class of 37—15 in the agricultural courses and 22 in engineering courses.

The college was also established under the Morrill Land-Grant Act passed by the National Congress in 1862. Clemson University, therefore, is a member of the national system of Land-Grant Colleges and Universities.

In 1964, in recognition of expanded offerings of the institution not only in the areas of agricultural and mechanical arts but also in the sciences and arts, the name of the institution was changed to Clemson University. This change by the legislature, effective July 1, 1964, followed a recommendation to that body by the Board of Trustees.

LOCATION

The University is located on the Fort Hill homestead of John C. Calhoun, in the foothills of the Blue Ridge Mountains. It has an elevation of 800 feet above sea level and commands an excellent view of the mountains to the north and west, some of which attain an altitude of over 5,000 feet.

The University is located at Clemson, S. C., on the main line of the Southern Railway, U. S. Highways numbers 76 and 123 pass through Clemson, and daily bus service at regular intervals is available.

ALUMNI RELATIONS

The office of alumni relations coordinates all functions and services of the alumni office. The director of alumni relations is secretary of the Clemson Alumni Association and the Clemson Foundation through election by the governing boards of these two organizations.

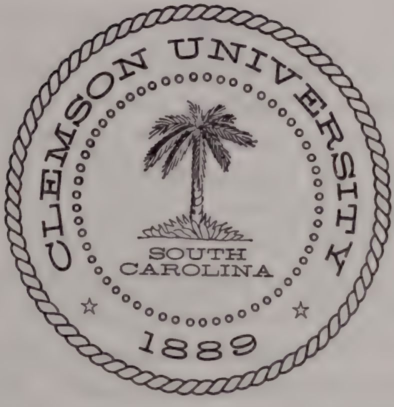
Accurate records of addresses and information concerning alumni are being compiled by this office which also publishes a magazine and newsletter for distribution to the alumni.

The purpose of the Alumni Association is to serve the University and its alumni in every possible way. The Association holds its regular annual meeting at the University each June. Active membership is made up of former Clemson students who participate in the Clemson Alumni Loyalty Fund for the purpose of providing supplementary financial aid to the educational programs of the University.

The Clemson University Foundation was founded by interested members of the Alumni Association to raise an endowment to be used for the benefit of the University, its students, faculty and alumni. Trustees of the Foundation are elected by the Association.

THE J. E. SIRRINE TEXTILE FOUNDATION

Funds in this foundation were contributed by the members of the textile industry in South Carolina and amount to about one million dollars. Income from this fund is administered by the trustees of the J. E. Sirrine Textile Foundation. They have used the income to benefit textile teaching and research at Clemson University. Under the present system it is used to (1) supplement university travel funds for faculty members, (2) sponsor the school library by paying the salary of the librarian and paying for periodicals and books, (3) provide supplement to the salaries for two major professors, (4) provide two undergraduate scholarships and four graduate fellowships annually, one of which may be held by a faculty member, (5) sponsor annual seminars for South Carolina high school counselors, (6) and support special research projects.



PART III

STUDENT LIFE AND ACTIVITIES

PART III—Student Life and Activities

STUDENT BODY

The students of Clemson University believe that student government is necessary and beneficial and that every student should be represented in this government. All registered undergraduate and graduate students are upon payment of the Student Activities Fee members of the Student Body of Clemson University which in turn is represented by the student government.

Student government is actively sponsored and highly effective at Clemson. The three branches of government are patterned after our federal system; however, there are no political parties within the framework of this student organization. March and April are election months for student-body and class officers except for the freshman class which holds class-officer and Student Senate elections in September. Students interested in self-government are encouraged to participate in this active student organization.

STUDENT PUBLICATIONS

The *Chronicle* is a student variety magazine published four times a year.

The *Taps* is the yearbook published by the students of the University.

The Tiger is a weekly paper published by the students of the University.

THE STUDENT CENTER

The student center, located in Johnstone Hall, has a student lounge with space for reading and games and two television sets. On the third floor there are meeting rooms and the student chapel. Also in this area are the offices of student publications, such as *The Tiger,* student newspaper; the *Taps,* annual publication; and Radio Station WSBF. The visitors' lounge and the information center are on the first floor off the loggia. The bookstore, post office, and canteen are located on the levels below the loggia.

CULTURAL, MUSICAL, THEATRICAL ACTIVITIES

University Concert Series

Each year since 1940 Clemson University has sponsored a concert series. All Clemson students paying full-time student activities fees are admitted to these concerts without charge. Others, including faculty members, may purchase tickets at a moderate cost.

The Program of Concerts for 1971-72 is:

First Moog Quartet
Preservation Hall Jazz Band
Five by Six
Roger Wagner and the Westminster Chorale
National Orchestra of Belgium
"I Do, I Do!" with Jack and Sally Jenkins

Architectural Foundation Lectures and Exhibits

The College of Architecture at Clemson is able to present annually an outstanding series of lectures, which are open to all Clemson students, through financial grants from the Clemson Architectural Foundation. The Foundation also presents an annual schedule of at least 12 art exhibits in the Architectural College gallery, which is open to the public weekdays between 9 a. m. and 4:30 p. m.

University Bands

Tiger Band. The Tiger Band and Color Guard, composed of approximately 120 members, participate in football games, pep rallies, functions, and parades throughout the South. This band has appeared in major stadiums in many states, including the Gator, Orange, Sugar, and Bluebonnet Bowls and has performed on national television. The Tiger Band makes several out-of-town trips during the fall season. A smaller "pep band" from its ranks performs at all home basketball games.

Concert Band. The Clemson Concert Band is composed of the better musicians on campus. It is formed at the end of the football season, and gives concerts both on and off the campus, including a tour in the spring. This organization plays music of the great composers in addition to lighter fare.

Army and Air Force ROTC Bands. These bands participate in all major military functions, including ceremonial parades and reviews. (Admission is open to all qualified ROTC personnel.)

University Chorus. The University Chorus comprises some eighty students who perform a wide variety of choral music in concerts presented on campus and on an annual spring concert tour. An audition is required for new members, with prime consideration given to singing ability and balance of voices.

Clemson Players. This is the dramatic club of the University and is open to all students interested in dramatics. Four productions are presented annually.

UNIVERSITY UNION PROGRAMS

Many of the student social, cultural, physical, and spiritual programs on campus are sponsored by and coordinated by the offices of the University Union Director. Those student-centered activities falling under the area of Student Union programs are the University YMCA, the emerging Student Union Building, Religious Affairs, Foreign Student Affairs, and Community Services.

The University YMCA

The YMCA provides a well-balanced program of religious, social, recreational, and cultural activities for students. The YMCA is administered by an Advisory Board consisting of students, faculty and staff, and all student programs are planned and administered by a YMCA Cabinet of students. Some YMCA programs are hall forums, films, seminars, visiting speakers, dances, picnics, and other social activities. A major share of YMCA programming is devoted to activity groups such as karate classes, scuba diving, water safety classes, and other groups interested in physical and social growth.

Union Building Program

A very effective program of social, cultural, and recreational programs are in the planning stages for the emerging new University Union Building. These programs will be planned and administered by a Union Board consisting of students, faculty, and staff of the University.

Religious Affairs

Religious life on the campus is coordinated by the Union Director in cooperation with local campus ministers and clergymen. The YMCA Building provides a place for denominational groups not having a church at Clemson, as well as for many interdenominational groups. The Student Center in Johnstone Hall also contains a Student Chapel which is available for use on a regularly scheduled basis.

Student religious organizations at Clemson offer students an opportunity to grow spiritually and socially. These organizations are:

Baptist Student Union
Christian Science Organization
Church of Christ Student Organization
Campus Crusade for Christ
Episcopal Student Association
Hillel-Brandeis (Jewish)
Lutheran Student Association
Newman Student Association (Catholic)
The Navigators
Wesley Foundation (Methodist)
Westminster Fellowship (Presbyterian)

Foreign Student Affairs

More than 100 foreign students are enrolled at Clemson, and the University feels strongly that special emphasis should be placed on work with these students. Mr. Otis Nelson, Associate Director of the YMCA, is Director of Foreign Student Affairs and gives guidance to its program of education, social life, personal counseling, and legal affairs.

Community Services

Many students at Clemson are concerned not only about fellow students but also about persons in the Clemson community and surrounding area. This concern becomes involvement and action as students go out into the community to serve as volunteer coaches, tutors, friends, counselors, candy stripers, and those who serve as helpers in Day Care Centers, children's homes, and in other different ways. The purpose of the Community Services program is to coordinate these efforts and services to better serve the campus and community.

The general purpose of the overall Campus Union Program is to serve student needs and interests, and the Union will continually seek to provide these opportunities for students on the Clemson University campus.

CAMPUS LEADERSHIP AND SERVICE

Block "C" Club—The Block "C" Club includes varsity lettermen in baseball, basketball, football, track, cheerleading, swimming, and soccer.

Tiger Brotherhood—A local honorary service fraternity composed of men students from the upper three classes who have demonstarted ability, character and loyalty to Clemson University.

Circle"K" International—International Service Club for college men sponsored by Kiwanis International.

Central Dance Association—The C.D.A. staff is responsible for planning and coordinating major dance weekends at which time name entertainment is brought to the campus.

WSBF—WSBF is an educational radio station managed, maintained and operated by a student staff for the enjoyment of the Clemson student body and the surrounding academic community. The station broadcasts 24 hours a day on both open circuit FM and closed circuit AM from a modern studio in the University Student Center.

Order of Athena—A local honorary society for senior women who have maintained a high standard of scholarship, demonstrated leadership, and shown a spirit of service to the University.

Phi Sigma Omega—A local honorary society for freshman women who have maintained a high standard of scholarship.

NATIONAL HONOR SOCIETIES

Clemson University has chapters of the following members of the Association of College Honor Societies:

Delta Sigma Rho–Tau Kappa Alpha (Forensics)
Phi Eta Sigma (Scholarship—Freshman Men)
Phi Kappa Phi (Scholarship—Senior Men and Women)
Tau Beta Pi (Engineering—Men and Women)
Tau Sigma Delta (Architecture and Allied Arts—Men and Women)

Other Honor Societies:

Sigma Xi (Scientific Research—Men and Women)
Xi Sigma Pi (Forestry—Men and Women)

NATIONAL RECOGNITION SOCIETIES

The following national recognition societies have chapters established at Clemson:

Alpha Phi Omega (Campus Service—Men)
Alpha Zeta (Agriculture)
Angel Flight (Air Force—Women)
Arnold Air Society (Air Force—Men)
Block and Bridle Club (Animal Science)
Blue Key (Scholarship, Leadership, Service—Men)
Gamma Sigma Sigma
Iota Lambda Sigma (Industrial Education)
Pershing Rifles—Company C-4 (Military)
Pershing Rifles—4th Regimental Headquarters
Scabbard and Blade—Company K-7 (Military)

DEPARTMENT AND PROFESSIONAL ORGANIZATIONS

Agricultural and Biological Sciences Council
Agronomy Club
Alpha Tau Alpha (Agricultural Education)
American Agricultural Economics Association
American Association of Textile Chemists and Colorists
American Association of Textile Technology
American Ceramic Society
American Chemical Society
American Dairy Science Association
American Institute of Aeronautics and Astronautics
American Institute of Architects
American Institute of Chemical Engineers
American Society of Agricultural Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
American Society for Metals
Associated General Contractors of America, Inc.
Botany Club
Calhoun Forensic Society
Calhoun Literary Workshop
Capers (Co-ed Pershing Rifles)
Clio Society
Counter Guerrilla Platoon

Dairy Science Club
Delta Sigma Nu (Pre-med)
Food Science Club
Forestry Club
French Club
Gamma Alpha Mu (English)
Graphic Arts Society
Horticulture Club
Institute of Electronic and Electrical Engineers
Iota Mu Sigma (Industrial Management)
Keramos (Ceramics)
Light Brigade (Army—Women)
McConnell Society (German)
Microbiology Society
Mu Beta Psi (Music)
Newtonian Society (Mathematics)
Omicron Delta Epsilon
Outing Club
Phi Delta Chi
Phi Psi (Textile Arts)
Photography Club
Poultry Science Club
Pre-law Society
Pre-veterinary Club
Recreation and Parks Administration Club
Sigma Pi Sigma (Physics)
Sigma Tau Epsilon (Arts and Sciences)
Society for the Advancement of Agricultural Education
Society for Advancement of Management
Society for American Military Engineers
Society of Physics Students
Student Education Association
Student Nurses Association
Zoology Club

GENERAL ORGANIZATIONS

Aero Club
Amateur Radio Club
Bowling Team
Campus Crusade for Christ
Carolina Sound Express

Dixie Skydivers Sport Parachute Club, Inc.
Fellowship of Christian Athletes
Fencing Club
Fine Arts Film Club
Four-H Club
Gamma Beta Phi (Beta Club Members)
Gamma Omega Phi (Political)
The Oxfords
Phi Sigma Omega (Freshman Women)
Rifle Club
Sailing Club
Skin and Scuba Diving Club
Sentimental Jazzmen (Music)
Sigma Psi Nu (Swimming)
Southern Student Organizing Committee
Student League for Black Identity
Students for Educational Aid
Tae Kwon Do Club (Karate)
University Political Caucus
Weightlifting Club
Young Democrats Club
YMCA Cabinet
Young Republicans Club

SOCIAL FRATERNITIES AND SORORITIES

In the spring and fall of 1970, the three local sororities and eleven of the local fraternities affiliated with national sororities and fraternities. The Board of Trustees, together with the President and Vice President for Student Affairs, had given formal approval to opening the Clemson campus to national fraternities and sororities in the spring of 1969.

Fraternities

Alpha Tau Omega (Delta Kappa Alpha)
Beta Theta Pi (Sigma Kappa Epsilon)
Chi Psi (Beta Sigma Chi)
Gamma Rho
Kappa Alpha (Phi Kappa Delta)
Kappa Sigma (Kappa Sigma Nu)
Phi Delta Theta (Delta Phi Kappa)
Pi Kappa Alpha (Sigma Alpha Zeta)
Sigma Alpha Epsilon (Numeral Society)

Sigma Nu (Kappa Delta Chi)
Sigma Phi Epsilon (Alpha Gamma)
Theta Chi (Chi Lambda)

The Interfraternity Council serves as the coordinating and governing body of the social fraternities.

Sororities

Chi Omega (Sigma Beta Chi)
Delta Delta Delta (Delta Theta Chi)
Kappa Kappa Gamma (Omicron Zeta Tau)

The Panhellenic Council coordinates the activities of the social sororities.

The names of former local fraternities and sororities are in parentheses.

REGIONAL CLUBS

The regional clubs of Clemson University are composed of international clubs, out-of-state clubs and clubs representing the various counties in the state. The regional clubs are made up of students who wish to unite with other students from their own home areas. These clubs include:

International Student Association
Kappa Delta Kappa (Dillon County)
Colleton County Club
Pi Kappa Rho (Pickens County)
Union Country Club

ATHLETIC PROGRAM

The University encourages students' interests in sports through a program of intercollegiate athletics and intramural sports.

It is a member of the Atlantic Coast Conference and its athletic teams, The Tigers, regularly play teams of that conference and other colleges. Membership of the Atlantic Coast Conference includes—in addition to Clemson University—Duke University, North Carolina State University, University of Maryland, University of North Carolina, University of South Carolina, University of Virginia, and Wake Forest University.

The intercollegiate athletic program includes football, basketball, baseball, track, tennis, golf, swimming, cross-country, and soccer. Each year over 200 teams are formed in softball, football, volleyball and basketball in the intramural program, with champions determined in each sport through a tournament.

Among the facilities for intramural and intercollegiate athletics at the University are tennis courts, baseball and track facilities, an indoor swimming pool, and a football stadium which will accommodate almost 50,000 people. The Littlejohn Coliseum, with a seating capacity of approximately 10,000 for basketball and up to 12,000 for other events, was completed in 1968. The Fike Fieldhouse is being renovated to accommodate intramural activities.

AUTOMOBILE PRIVILEGES AND PARKING REGULATIONS

All motor vehicles owned and operated on the campus by students, faculty, and staff members must be registered with the designated authorities. On registering, each student, faculty, or staff member will be offered a copy of the parking and traffic regulations and will be issued a decal which will indicate the areas in which the car may be parked.

Students are urged to familiarize themselves with all provisions of the Traffic Code contained in the *Student Handbook of Clemson University*.

PART IV

SCHOLASTIC REGULATIONS

PART IV—Scholastic Regulations

SCHOLASTIC REGULATIONS

Academic Standards. Proper discharge of all duties is required at Clemson University, and a student's first duty is his scholastic work. All students should be thoroughly acquainted with and cognizant of these basic requirements.

The Credit System. The semester hour is the basis of all credits. Generally, one recitation hour or 3 laboratory or shop hours a week for a semester constitute a semester hour. Thus, in Engl 101, English Composition, 3 cr. (3,0), as you will find this subject listed in the Degrees and Curriculums, the student takes 3 semester hours. When he completes this course satisfactorily, he is granted 3 semester credit hours on his record. The notation "3 cr. (3,0)" means that the course carries 3 credits, has 3 clock hours of theory or recitation per week, and no laboratory hours. Ch 101, General Chemistry, 4 cr. (3,3), carries 4 semester hours, has 3 hours of theory, and a 3-hour laboratory period.

Semester Grades. The standing of a student in his work at the end of a semester is based upon daily class work, tests or other work, and the final examinations. Faculty members may excuse from the final examinations all students having the grade of A on the work of the course prior to the final examination, but for all other students written examinations are required in all subjects at the end of each semester, except in certain laboratory or practical courses in which final examinations are not deemed necessary by the department faculty.

Scholastic reports are mailed to parents four times each year, including a preliminary statement of progress near the middle of each semester, and a final report at the end of each semester.

The Grading System. The grading system is as follows:

A—*Excellent.* Indicates that the student is doing work of a very high character. The highest grade given.

B—*Good.* Indicates work that is definitely above average, though not of the highest quality.

C—*Fair.* Indicates work of average or medium character.

D—*Pass.* Indicates work below average and unsatisfactory. The lowest passing grade.

F—*Failed.* Indicates that a student knows so little of the subject that it must be repeated in order that credit may be received.

I—*Incomplete Work.* Indicates that a relatively small part of the semester's work remains undone. Grade I is not given a student who has made a grade F on his daily work. Students are allowed 30 days after the beginning of the next semester in which the student is enrolled to remove the incomplete grade unless (1) an extension of time is approved by the instructor concerned, or (2) within one year of residence after receiving such a grade, a student repeats the conditioned course satisfactorily at Clemson, in which case no credit hours taken shall be recorded for the grade of I. A student who elects to repeat an incomplete course is responsible for notifying the Office of Admissions and Registration of his election during the semester in which the course is taken. This regulation applies only to the first time that a course is repeated.

In order to make up incomplete work, the student must first obtain a permit card from the Office of Admissions and Registration. This card serves as the authority for the removal of the I and also as a form for reporting the final grade.

WP—*Withdrew Passing.* This grade indicates that the student withdrew from the course while doing satisfactory work. No credit hours taken are recorded for the grade of WP provided that the course is dropped prior to the last three weeks of classes in the semester. Only semester grades shall be given and recorded for courses dropped during the last three weeks.

WF—*Withdrew Failing.* Indicates that the student withdrew from the course while doing unsatisfactory work. The credit hours of a subject on which the grade of WF is received are counted as credits taken in computing the student's grade-point ratio.

Dropping Class Work. A subject dropped after the first four weeks of class work is recorded as "Withdrew Passing" or "Withdrew Failing" depending upon the student's grade in the course at the time the subject was dropped.

Upon the recommendation of the instructor and the dean concerned, a student's standing will be investigated and he may be required to drop a subject because of neglect, or lack of application or preparation. No student will be dropped under this rule without approval of the President.

Removal of Failures. A student who has failed (made a grade F) in a subject cannot receive credit for that subject until it has been satisfactorily repeated hour for hour in class, except that in the case of correlated laboratory work, the number of hours to be taken shall be determined by the instructor. Where separate grades for class and laboratory work are given, that part of the subject shall be repeated in which the failure occurs.

Rescheduling Courses Failed. A student who wishes to reschedule a course he has failed must do so within his next year of residence, or, if the course is not offered during this year of residence, he must reschedule the course the first time it is offered thereafter during his attendance at Clemson.

Rescheduling Courses Passed. A student may repeat a course he has passed with a grade lower than B provided he does so within three semesters of residence after the completion of his original enrollment in the course.

Scheduling Remedial Mathematics. Any student who has passed a course in freshman mathematics is ineligible to enroll in Remedial Mathematics.

Withdrawal from the University. A student may withdraw from the University any time before the last three weeks of classes in the semester without having grades recorded. A student enrolled the last three weeks of classes shall have final semester grades recorded.

A student withdrawing from college after preliminary reports are due must be passing a minimum of 12 semester credit hours at the time of withdrawal to qualify for re-enrollment the following semester.

After the first withdrawal from college the student is eligible to continue his enrollment the following semester, provided he meets other applicable regulations. For each succeeding withdrawal, however, the student shall be ineligible to continue his enrollment the following semester unless there are extenuating circumstances approved by the Committee on Admissions.

Grade Points. Four grade points are assigned for each credit hour on which the student receives the grade of A, 3 grade points for each credit hour of grade B, 2 grade points for each credit hour of grade C, and 1 grade point for each credit hour of grade D. No grade points are assigned for grades F, I, WP, or WF.

Grade-Point Ratio. In calculating a student's grade-point ratio, the total number of grade points accumulated by the student is divided by the total number of credit hours taken by the student at Clemson during the semester, session, or other period for which the ratio is calculated.

The grade-point ratio of students entering college for the first time will be determined as follows: Students entering during the summer sessions or fall semester will have only those courses passed for credit during the summer sessions and/or the following fall semester counted toward their grade-point ratio; students entering the spring semester will have only those courses passed for credit during the spring semester and/or the following summer sessions counted toward their grade-point ratio. This policy does not apply to transfer students.

Minimum Requirements for Continuing Enrollment. At the end of the academic year in May, all student records are inspected for quality. At that time in order to be able to continue his enrollment, a student who has taken a total of:

(a) 24 to 59 credit hours at Clemson must have a cumulative grade-point ratio of 1.30 or above.
(b) 60 to 89 credit hours at Clemson must have a cumulative grade-point ratio of 1.50 or above.
(c) 90 or more credit hours at Clemson must have a cumulative grade-point ratio of 1.70 or above.

A student completing a regular session has the privilege of continuing his enrollment through the immediately following summer session at Clemson or in Clemson parallel programs in an effort to meet the above requirements.

A student who has taken fewer than 90 credit hours at Clemson and who fails to meet the required grade-point ratio, as indicated in the table above, may apply for readmission after a minimum of one semester has elapsed. A student who has taken 90 or more credit hours and fails to meet the required grade-point ratio is permanently ineligible for readmission. Any exceptions to these minimum requirements for continuing enrollment and readmission must be approved by the Admissions Committee of the University.

Advanced Placement by Examination. In addition to earning credit by the usual method involving classroom attendance, students may receive credit toward their degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Credit by Examination. Credit may be earned by means of a special examination without the necessity of class attendance subject to the following requirements:

(1) The applicant must present evidence which would indicate that he has received training or taken work which is approximately equivalent to that given in the course at Clemson for which an examination is requested and that an examination is warranted.

(2) The applicant must not have previously failed or audited the course at Clemson.

(3) The applicant must apply in writing for the examination and the request must be approved by the Instructor, Head of the Department in which the course is taught, Dean of the College or School in which the course is taught, and the Dean of Admissions and Registration.

(4) A grade of not less than C on the examination is necessary in order for the examinee to receive credit on the course. An examinee receiving credit under this provision receives credit for "hours taken," "hours earned," and grade points as well as the course grade.

(5) The time of the examination will be arranged by the student with the instructor concerned, but must be taken within one month after the date of final approval or it will be necessary for the student to initiate another request.

Work Taken at Another Institution. Clemson students may receive credit for work taken at another institution; however, approval of the work should be obtained by the student prior to scheduling the work. Information and forms relative to this approval may be obtained in the Office of Admissions and Registration. By obtaining advance approval the student is assured of receiving proper credit at Clemson provided he passes the work with a grade one letter grade higher than the lowest passing grade.

Classification. All new students are classified as freshmen unless they have attended another college prior to entrance. For those students who have completed college work elsewhere, classification will be based on semester hours accepted at Clemson rather than the amount of work presented.

To be classified as a sophomore, a student must have completed at least 30 semester hours.

To be classified as a junior, a student must have completed at least 60 semester hours.

To be classified as a senior, a student must have completed at least 95 semester hours.

Regular Advancement in Classification. All students are urged to meet the requirements for sophomore classification by the beginning of the second year, for junior classification by the beginning of the third year, and for senior classification by the beginning of the fourth year. Failure to meet these requirements can jeopardize a student's academic standing with the University as well as jeopardize his deferment under the Selective Service even though he may be otherwise eligible for the deferment.

Course Prerequisites. Prerequisites for individual courses are enumerated under the course listings in the Description of Courses. In addition to these requirements, colleges, schools, and departments may also establish other standards as conditions for enrollment. In the College of Engineering a grade-point ratio of 1.80 or higher is required for registration in all Engineering courses numbered 300 or higher.

Credit Load. Except for an entering freshman, who is restricted to the curriculum requirements of his major course, the credit load for an undergraduate must be approved by his class adviser. The class adviser will approve a credit load deemed in the best interest of the student based on such factors as course requirements, grade-point ratio, participation in other activities, and expected date of graduation.

Since grades are an important factor in determining credit loads, the student should be guided by the following table in presenting his schedule to his class adviser for approval:

Grade-Point Ratio (Semester or Cumulative, Whichever Is Higher)	*Recommended Maximum Number of Semester Hours to Be Scheduled*
0.00 to 0.99	14 to 16
1.00 to 1.99	16 to 18
2.00 to 2.99	18 to 20
3.00 to 4.00	20 to 22

When any full-time student reduces his credit load below 12 hours, but is still carrying 9 or more, he may be suspended for at least the remainder of the semester upon recommendation of the Vice President for Student Affairs and approval of the President. When a student reduces his credit load below 9 hours he shall be suspended for at least the remainder of the semester.

Auditing Policies. Qualified students may audit courses upon the written approval of the professor, head of the department and the dean of the college or school concerned, and registration with the Dean of Admissions and Registration. Auditors are under no obligation of regular attendance, preparation, recitation, or examination and receive no credit. Participation in classroom discussion and laboratory exercises by auditors is at the discretion of the instructor. A student who has previously audited a course is ineligible for credit by examination.

A full-time undergraduate student with approval may audit courses at no additional charge as long as the student's credit load, including the course audited, is approved by his class adviser.

A graduate student regularly enrolled for a minimum of six semester hours may with approval audit one additional course without charge.

Members of the University teaching staff and the professional staff in research and agricultural extension may with approval audit courses without charge. Other full-time University employees may audit without charge with the additional approval of the employee's immediate supervisor and the Comptroller.

Residence Requirement for Graduation. In order to qualify for an undergraduate degree, a student must spend at least the last year of residence at Clemson and complete at Clemson a minimum of 30 of the last 36 credits presented for the degree.

Honors Program. The Honors Program at Clemson University provides for the fuller development of our most able students. They meet in small classes with outstanding professors and explore the subject matter of a course in greater depth than other students are able to do. The identification and selection of Honor Students begins with their freshman year, and Honors courses are provided at all four levels of undergraduate instruction. To remain in the Honors Program a student must maintain a cumulative grade-point ratio of 3.00.

An Honors Council composed of faculty members from each College and School is responsible for planning and supervising the Honors Program. *The Honors Program: A Student Handbook* is available for those who are interested.

Honors and Awards Day. Each spring an Honors and Awards Day is held for students who qualify for the honor list and for special awards. A cumulative grade-point ratio of 3.00 to 3.49 is required for listing with honor, 3.50 to 3.79 for high honor, and 3.80 or above for inclusion with highest honor.

Honor Graduates. Students who graduate in the Honors Program will have this fact indicated on their diplomas. Other graduates who meet the required qualifications are designated as having graduated with honor. A grade-point ratio of 3.00 to 3.49 is required for graduation with honor, 3.50 to 3.79 for high honor, and 3.80 or above for graduation with highest honor.

Examination on F Received in Last Semester. A candidate for a degree who in the semester immediately prior to graduation fails to graduate because of an F on one course taken in that semester may stand a special examination on the course provided:

(1) That the candidate can furnish evidence of having done satisfactory study for the examination.

(2) That the examination is not given until after the regular degree date.

(3) That the candidate has fulfilled, prior to the due date for candidates' grades, all other requirements for his degree except those which can be fulfilled by passing the examination.

(4) That the candidate by removing the F by examination will finish all requirements for his degree which will be awarded on the next regular date for award of degrees.

Make-ups of I's Received in Last Semester. A candidate for a degree who in the semester immediately prior to graduation receives one or more grades of I shall have an opportunity of removing the unsatisfactory grades provided the final grades are received in the Office of Admissions and Registration by the time grades for candidates for graduation are due.

A candidate who qualifies for graduation under this regulation will be awarded his degree on the regular date for the award of degrees.

Special Graduation Requirements. A cumulative grade-point ratio of 2.00 is required for graduation. Candidates for degrees are required to apply for their diplomas within two weeks following the opening of the final semester or the opening of the summer session prior to the date the degrees are to be awarded. These applications should be filled out in the Office of Admissions and Registration on the regular blanks provided.

All work for a degree must be completed, all financial settlements made, and all government property and library books returned by 5 p. m. on the Tuesday preceding graduation.

A student in line for graduation at the end of this semester who fails to graduate because of an F on one course taken this semester may stand a special examination under certain conditions on the course *after the regular degree date.* A senior who qualifies for graduation under this provision will be awarded his degree *on the next regular date* for the award of degrees. For further information see paragraph **Examination on F Received in Last Semester.**

A student in line for graduation at the end of a semester or summer term who meets all requirements for graduation except for a deficiency in his grade-point ratio resulting from a deficiency of not more than six grade points shall have the privilege of making up his deficiency by standing special reexaminations under certain conditions.

The examinations shall be taken after the regular degree date and in courses totaling not more than 6 semester credit hours which were passed during the last year of residence, and only one such examination may be taken on an individual course. When such examinations are taken under the above provision, the credit hours of the course or courses will not be counted as additional credit hours taken. Only the grade points over and above the grade points previously earned in the course may count toward raising the grade-point ratio.

A student who qualifies for graduation under this provision will be awarded his degree on the next regular date for the award of degrees.

If all work toward a degree is not completed within five years after entrance, the student may be required to take additional courses.

PART V

DEGREES AND CURRICULUMS

PART V—Degrees and Curriculums

BACHELORS' DEGREES

The degree of Bachelor of Science is awarded to those students who satisfactorily complete one of the four-year curriculums offered under the College of Agriculture and Biological Sciences, the College of Engineering, or the College of Forest and Recreation Resources. In the College of Education, the Bachelor of Science degree is awarded to those completing the requirements in Agricultural Education, Industrial Education, and Science Teaching. The Bachelor of Arts degree is granted to those completing the curriculum in Elementary Education or the Secondary Education curriculum with a teaching major in Economics, English, History, Modern Languages, Mathematics, Natural Sciences, Political Science, Psychology, or Sociology. In the College of Industrial Management and Textile Science, the Bachelor of Arts degree is awarded to those completing the curriculum in Economics; and the Bachelor of Science degree is awarded to those completing the requirements in Accounting, Administrative Management, Financial Management, Industrial Management, Textile Chemistry, or Textile Science. In the College of Liberal Arts, the Bachelor of Arts degree is awarded to those students who satisfactorily complete the curriculum with major concentrations in English, History, Modern Languages, Political Science, Psychology, or Sociology. In the School of Nursing, the Bachelor of Science degree is awarded to those students completing requirements in the four-year Nursing curriculum. In the College of Physical and Mathematical Sciences, the Bachelor of Science degree is awarded to those students completing the requirements in Chemistry, Geology, Mathematics, Medical Technology, Physics, or Pre-medicine, and the Bachelor of Arts degree is awarded to those completing the Arts and Sciences curriculum.

The College of Architecture offers a six-year professional program embracing two degrees and leading to the professional degree, Master of Architecture. After the first degree, students may opt to seek the Master of City and Regional Planning degree offered by the College. The degree of Bachelor of Arts in Pre-architecture requiring 137 credit hours is awarded at the end of four years and the first professional degree, Master of Architecture, includes 68 additional semester hours for a total of 205.

The Bachelor of Science degree in Building Construction is a four-year program requiring 141 credit hours.

ASSOCIATE DEGREE

The School of Nursing offers, in addition to the baccalaureate program in nursing, an Associate in Arts degree program in nursing. This program normally requires four semesters and one summer term, a minimum of 71 semester credit hours.

GRADUATE DEGREES

The degrees of Doctor of Philosophy, Master of Arts, Master of Science, Master of Agricultural Education, Master of Agriculture, Master of Architecture, Master of City and Regional Planning, Master of Education, Master of Engineering, Master of Forestry, and Master of Industrial Education are awarded to those students who satisfactorily complete prescribed graduate programs. Also, the Master of Business Administration degree is available through a joint program with Furman University.

For further information concerning advanced degrees see *The Graduate Bulletin,* which may be obtained from the Office of the Dean of Graduate Studies and University Research.

UNDERGRADUATE CURRICULUMS

Forty-seven undergraduate curriculums are offered under the Colleges of Agriculture and Biological Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, and Physical and Mathematical Sciences, and the School of Nursing. The curriculums under each college and school are listed below:

College of Agriculture and Biological Sciences
- Agricultural Economics
- [†]Agricultural Education
- [*]Agricultural Engineering
- Animal Industries
- Biology
- Food Science
- Plant Sciences
- Pre-veterinary

College of Architecture
- Building Construction
- Pre-architecture

College of Education
- [†]Agricultural Education
- Early Childhood Education
- Elementary Education
- Industrial Education
- Science Teaching
- Secondary Education

[†] Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

[*] Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

College of Engineering
- [*]Agricultural Engineering
- Ceramic Engineering
- Chemical Engineering
- Civil Engineering
- Electrical and Computer Engineering
- Engineering Analysis
- Mechanical Engineering
- Technical Operations

College of Forest and Recreation Resources
- Forestry
- Recreation and Park Administration

College of Industrial Management and Textile Science
- Accounting
- Administrative Management
- Economics
- Financial Management
- Industrial Management
- Textile Chemistry
- Textile Science

College of Liberal Arts
- English
- History
- Modern Languages
- Political Science
- Psychology
- Sociology

School of Nursing
- Baccalaureate Program
- Associate Degree Program

College of Physical and Mathematical Sciences
- Arts and Sciences
- Chemistry
- Geology
- Mathematics
- Medical Technology
- Physics
- Pre-medicine or Pre-dentistry
- Pre-pharmacy

In the curriculums which follow are given the official title and number of the course, the descriptive title, the number of semester hours credit, and in parentheses the number of hours per week in class and laboratory, respectively.

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

The undergraduate curriculums offered by this College are presented under two classifications—*Agriculture* and *Biological Sciences.*

AGRICULTURE

Modern agriculture is the science, business, and art of producing, processing, and distributing plant and animal products, including those aspects of economics and human relations connected with these activities. Agriculture is a unique area in education because it applies the basic sciences to biological material for economic implications.

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[*] Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

Today's agriculture includes much more than farm production. About 6 million people provide supplies and services for farmers and 10 million process and distribute farm products. These two segments together with farm production, which employs 5 million workers, provide jobs somewhere in agriculture for 21 million Americans—approximately one-third of all jobs.

Thousands of agricultural graduates are needed each year in this basic industry. Our land-grant colleges and universities are now graduating considerably less than the total number needed to fill the jobs available each year—jobs important to every person, jobs with futures, jobs with challenge, jobs with personal and financial rewards.

The total program in Agriculture at this institution includes Resident Instruction, Research (Agricultural Experiment Station), and Extension (Agricultural Extension Service). Organized under Resident Instruction are curriculums in Agricultural Economics, Agricultural Education,* Agricultural Engineering,† Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), Biology (major in Entomology), Food Science, Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental), and Pre-veterinary Medicine.

The curriculums in Agriculture are continuously revised to meet the changing needs of this dynamic industry. In this connection, students in many of the curriculums now have the opportunity to specialize by choosing a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

Science Minor—This minor emphasizes the basic sciences that prepare students to contribute to the advancement of knowledge in their respective fields. It is designed for students whose anticipated work requires considerable scientific training, usually including graduate studies. Employment opportunities include research with State Agricultural Experiment Stations, the United States Department of Agriculture, and industrial and commercial organizations; and teaching in colleges of agriculture, and other educational work with Federal, State and industrial organizations.

Business Minor—This minor emphasizes principles and practices of business management as applied to businesses and industries associated with agriculture. It is designed for students who plan to work with one of the many businesses and industries that provide supplies and services for the farmer, and process and distribute farm products. Employment opportunities include work related to meat and poultry processing, sales and service of farm machinery, manufacturing and sales of fertilizers and pesticides, dairy and food processing, grain and seed processing, feed manufacturing, banking and credit, insurance, farm management, land appraising, and the marketing of agricultural commodities.

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* Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

† Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

Production Minor—This minor emphasizes the application of scientific principles to agricultural production. It is designed for students whose anticipated work requires broad general training in scientific and practical agriculture. Employment opportunities include general and specialized farming; agricultural extension services; teaching vocational agriculture; conservation of natural resources; agricultural communication; and agricultural services of the United States Department of Agriculture, State Departments of Agriculture and private enterprises.

International Agriculture Minor—This minor emphasizes the international aspects of agriculture and applies basic scientific principles and agricultural practices to worldwide agriculture. It is designed for students who contemplate work in international agricultural positions either in the United States or abroad. Employment opportunities include positions with the Foreign Agricultural Service of the United States Department of Agriculture, with foundations such as the Ford Foundation, with the Agency for International Development, with industries such as United Fruit Company, and with other domestic and foreign interests.

Second Department Minor—This minor emphasizes special training in an area of study other than the major. A *Second Department* minor may be selected either within or outside of the College of Agriculture and Biological Sciences. It is designed for students who wish additional specialized training outside their major area of study. Additional information relative to employment opportunities open to students with a minor in a *Second Department* is given elsewhere in this catalog under the various curriculum listings.

To illustrate further the types of work in which graduates engage, a few of the many occupations of agricultural graduates are listed under each curriculum.

FRESHMAN YEAR CURRICULUMS

[For students in Agricultural Economics, Agricultural Education, Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), and Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental.)]

First Semester			*Second Semester*		
Agric 101 Introd. to Agric.	1	(1,0)	Bot 102 Prin. of Botany	2	(2,0)
Biol 101 Prin. of Biology	3	(3,0)	Bot 104 Lab. Exer. in Bot.	1	(0,2)
Ch 101 Gen. Chemistry	4	(3,3)	or Zool 104 Lab. Exer. in Zool.	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 Gen. Chemistry	4	(3,3)
Hist 102 Amer. History	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 103 College Algebra	2	(3,0)	Math 104 Trigonometry	2	(3,0)
AS or MS or Elective	1		Zool 102 Prin. of Zoology	2	(2,0)
			AS or MS or Elective	1	
	17			15	

[For students in Biology (major in Entomology),[*] Food Science, and Preveterinary Medicine.]

First Semester			*Second Semester*		
Agric 101 Introd. to Agric.	1	(1,0)	Bot 102 Prin. of Botany	2	(2,0)
Biol 101 Prin. of Biology	3	(3,0)	Bot 104 Lab. Exer. in Bot.	1	(0,2)
Ch 101 Gen. Chemistry	4	(3,3)	or Zool 104 Lab. Exer. in Zool.	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 Gen. Chemistry	4	(3,3)
Math 103 College Algebra	2	(3,0)	Engl 102 English Composition	3	(3,0)
Math 104 Trigonometry	2	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
AS or MS or Elective	1		Zool 102 Prin. of Zoology	2	(2,0)
			AS or MS or Elective	1	
	16			17	

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[*] Biology students majoring in Entomology take both Bot 104 and Zool 104.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

The curriculum in Agricultural Economics places emphasis on a strong background in economic theory with applications to agricultural and agriculturally related businesses. Also included are courses in basic agricultural and biological sciences, liberal arts, and business. Students with a major in agricultural economics now have the opportunity to further specialize by selecting a minor in *Science, Business, International Agriculture,* or a *Second Department.*

Employment opportunities open to graduates with degrees in Agricultural Economics are many. They include research and teaching in institutions of higher learning; sales and promotional work for a variety of businesses; management positions in the farm loan departments of private banks or with cooperative farm credit agencies; public relations activities for various firms; market managers and directors; county agents; representatives of government agencies serving agriculture; and operators of numerous enterprises.

AGRICULTURAL ECONOMICS CURRICULUM

AGRICULTURAL ECONOMICS MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 201 Introd. to Animal Indus.	3	(2,3)	Ag Ec 202 Agric. Economics	3	(3,0)
Agron 202 Soils	3	(2,2)	Ag Ec 305 Agric. Bus. Anal.	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	or Acct 201 Prin. of Accounting	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Agric 202 Introd. to Plant Sciences	3	(2,3)
or Hist 172 Western Civilization	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
or Engl 203 Survey of Engl. Lit.*	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	or Hist 173 Western Civilization	3	(3,0)
AS or MS or Elective	1		Phys 207 Gen. Physics	4	(3,2)
	17		AS or MS or Elective	1	
				17	

JUNIOR YEAR

Ag Ec 309 Econ. of Agric. Marketing	3	(3,0)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Ag Ec 357 Natural Resource Econ.	3	(3,0)	Ag Ec 352 Public Finance	3	(3,0)
Econ 314 Intermed. Econ. Theory	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Ex St 301 Introd. Statistics	3	(2,2)	or Engl 304 Advanced Comp.	3	(3,0)
Minor†	6		Ex St 462 Stat. Applied to Econ.	3	(3,0)
			Minor†	6	
	18			18	

SENIOR YEAR

Ag Ec 405 Seminar	1	(1,0)	Ag Ec 402 Econ. of Agric. Prod.	3	(3,0)
Ag Ec 452 Agricultural Policy	3	(3,0)	Ag Ec 406 Seminar	1	(1,0)
Gen 302 Genetics	4	(3,3)	Ag Ec 456 Prices	3	(3,0)
Minor†	3		RS 301 Rural Sociology	3	(3,0)
Approved Electives	5		Approved Electives	6	
	16			16	

134 Total Semester Hours

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* At least one literature course is required.

† See class adviser for available minors and course requirements.

AGRICULTURAL EDUCATION‡

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations and agricultural extension; farming, soil conservation and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in *Business, International Agriculture,* or in a *Second Department.* Students in other departments may minor in Agricultural Education and be certified to teach.

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‡ Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

AGRICULTURAL EDUCATION CURRICULUM

AGRICULTURAL EDUCATION MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ag Ed 201 Introd. to Agric. Ed.	3	(2,2)	AgE 205 Farm Shop	3	(2,3)
Agric 202 Introd. to Plant Sciences	3	(2,3)	AgE 206 Agric. Mechanization	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	Agric 201 Introd. to Animal Indus.	3	(2,3)
Hist 171 Western Civilization	3	(3,0)	Agron 202 Soils	3	(2,2)
or Hist 172 Western Civilization	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
or Engl 203 Survey of Engl. Lit.*	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	or Hist 173 Western Civilization	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

AgE 301 Soil and Water Conserva.	3	(2,3)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Agron 301 Fertilizers	3	(3,0)	An Sc 301 Feeds and Feeding	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	For 307 Elem. of Forestry	3	(2,3)
Approved Horticulture Elective	3		Minor†	9	
Minor†	3				
Approved Electives	3				
	18			18	

SENIOR YEAR

Ag Ec 452 Agric. Policy	3	(3,0)	Ag Ed 401 Methods in Agric. Educ.	3	(2,2)
Ent 301 Elem. and Econ. Ent.	3	(2,3)	Ag Ed 406 Directed Teaching	6	(0,18)
Hort 407 Landscape Design	3	(2,3)	Ag Ed 422 Introd. to Adult Educ.	3	(2,2)
Pl Pa 401 Plant Pathology	3	(2,3)	Ed 302 Educ. Psychology	3	(3,0)
Minor†	3				
Approved Electives	3				
	18			15	
			134 Total Semester Hours		

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* At least one literature course is required.

† See class adviser for available minors and course requirements.

AGRICULTURAL ENGINEERING*

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The Agricultural Engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

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* The Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to both the Master of Science and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, and extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

AGRICULTURAL ENGINEERING CURRICULUM

AGRICULTURAL ENGINEERING MAJOR

First Semester			*Second Semester*		
FRESHMAN YEAR					
Agric 101 Introd. to Agric.	1	(1,0)	Ch 102 General Chemistry	4	(3,3)
Ch 101 General Chemistry	4	(3,3)	Engl 102 English Composition	3	(3,0)
Engr 101 Engineering Systems	0	(1,0)	Humanistic—Social Elective	3	(3,0)
EG 109 Engr. Graph. Comm.	2	(0,6)	or EG 109 Engr. Graph. Comm.	2	(0,6)
or Humanistic—Social Elective	3	(3,0)	Math 108 Cal. and Linear Alg.	4	(5,0)
Engl 101 English Composition	3	(3,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	15 or 16			18 or 17	
SOPHOMORE YEAR					
AgE 221 Soil and Water Res. Engr I	3	(2,3)	AgE 212 Fund. of Mechanization	3	(2,3)
EM 201 Engr. Mech. (Statics)	3	(3,0)	Biol 101 Prin. of Biology	3	(3,0)
Engl 203 Surv. of Engl. Lit.	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Survey of Engl. and Amer. Lit.	3	(3,0)
Phys 221 Ther. and Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	
JUNIOR YEAR					
AgE 353 Computational Systems	2	(0,6)	AgE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AgE 355 Engr. Anal. and Creat.	2	(1,3)	AgE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
Bot 102 Prin. of Botany	2	(2,0)	Agron 202 Soils	3	(2,2)
Bot 104 Lab. Exer. in Bot.	1	(0,2)	EE 320 Electronics I	2	(2,0)
or Zool 104 Lab. Exer. in Zool.	1	(0,2)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
EE 307 Basic Elec. Engr.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
EM 304 Mechanics of Materials	3	(3,0)	Humanistic—Social Elective	3	(3,0)
ME 311 Engr. Thermo. I	3	(3,0)		18	
Zool 102 Prin. of Zoology	2	(2,0)			
	18				
SENIOR YEAR					
AgE 431 Agric. Struct. Design	3	(2,3)	AgE 416 Agric. Machinery Design	3	(2,3)
AgE 471 Undergraduate Research	1	(0,3)	AgE 422 Soil & Water Res. Engr. II	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	AgE 442 Agric. Proc. Engr.	3	(2,3)
EM 320 Fluid Mechanics	3	(3,0)	Bot 352 Plant Physiology	4	(3,3)
Math 301 Stat. Theory and Meth. I	3	(3,0)	or Zool 307 Animal Anat. and Physiol.	3	(2,3)
Approved Elective	3		or Micro 305 Gen. Microbiology	4	(3,3)
	16		ME 304 Heat Transfer	3	(3,0)
			Approved Electives	3 or 4	
				19	

138 Total Semester Hours

ANIMAL INDUSTRIES

The Animal Industries curriculum includes three majors—Animal Science, Dairy Science, and Poultry Science.

ANIMAL SCIENCE

The Animal Science Department emphasizes subject matter dealing with the application of scientific principles to livestock production and processing.

Students will minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

Occupations for Animal Science graduates include livestock farming; cattle, swine and sheep breeding; extension livestock specialists; feed specialists; county agents; teaching and research in animal industry; positions with meat packing companies; feed dealers; freezer locker operators; livestock dealers; and livestock commission brokers.

ANIMAL INDUSTRIES CURRICULUM

ANIMAL SCIENCE MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chem.[*]	3	(3,0)	Agric 202 Introd. to Plant Sciences	3	(2,3)
Ch 227 Org. Chem. Lab.[*]	1	(0,3)	An Sc 201 Introd. to Animal Sc.	2	(2,0)
or Ch 220 Elem. Org. Chem.	4	(3,3)	An Sc 203 Introd. to An. Sc. Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.[†]	3	(3,0)
Engl 203 Survey of Engl. Lit.[†]	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
or Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Phys 207 Gen. Physics	4	(3,2)
Zool 307 Animal Anat. and Phys.	3	(2,3)	Minor[‡]	3	
Minor[‡]	3		AS or MS or Elective	1	
AS or MS or Elective	1				
	17			17	

JUNIOR YEAR

First Semester			*Second Semester*		
An Sc 301 Feeds and Feeding	3	(3,0)	An Sc 303 Feeds and Feed. Lab.	1	(0,3)
An Sc 353 Meats	2	(2,0)	An Sc 306 Livestock Sel. & Eval.	2	(1,3)
An Sc 355 Meats Lab.	1	(0,3)	Engl 301 Public Speaking	3	(3,0)
Gen 302 Genetics	4	(3,3)	Social Science Elective[§]	3	(3,0)
Micro 305 Gen. Microbiology	4	(3,3)	Minor[‡]	6	
Approved Elective	3		Approved Elective	3	
	17			18	

SENIOR YEAR

First Semester			*Second Semester*		
An Sc 401 Beef Production	3	(3,0)	An Sc 406 Seminar	2	(2,0)
An Sc 403 Beef Prod. Lab.	1	(0,3)	An Sc 408 Pork Production	3	(3,0)
Dy Sc 453 Animal Reprod.	3	(3,0)	An Sc 410 Pork Prod. Lab.	1	(0,3)
Nutr 401 Fundamentals of Nut.	3	(3,0)	An Sc 452 Animal Breeding	3	(3,0)
Minor[‡]	3		Approved Electives	7	
Approved Electives	4				
	17			16	

134 Total Semester Hours

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[*] Required for Science Minor.

[†] At least one literature course is required.

[‡] See class adviser for available minors and course requirements.

[§] To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

DAIRY SCIENCE

The major in Dairy Science is designed to provide the student with an understanding of scientific principles and the application of these principles in the scientific, technical and business phases of the dairy industry. Completion of required studies in the sciences and humanities and selected courses by the student in areas of personal interest prepares the graduate for a successful chosen profession. A career in the dairy industry is a rewarding one, not only monetarily, but in rendering a service in providing a wholesome, nutritious food for mankind.

Opportunities for dairy science graduates are many. They include the management of production and processing facilities, quality control work for processing units and production organizations, industrial promotion and public relations work in both production and processing fields, dairy and food products engineering, special services, public health service, teaching and research. Special service opportunities are available in state and national breed association work, breeding organizations, industrial supplies, production and processing equipment and supplies. Opportunities in educational activities include positions with industrial associations, state and federal services and federal programs with foreign assignments.

Students majoring in Dairy Science may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

ANIMAL INDUSTRIES CURRICULUM

DAIRY SCIENCE MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Agron 202 Soils	3	(2,2)
Ch 220 Elem. Org. Chem.	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
or Ch 223 Org. Chem.	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
and Ch 227 Or. Chem. Lab.	1	(0,3)	or Hist 173 Western Civilization	3	(3,0)
Dy Sc 201 Introd. to Dairy Science	3	(2,3)	Phys 207 Gen. Physics	4	(3,2)
Econ 201 Principles of Econ.	3	(3,0)	Social Science Elective†	3	
Engl 203 Survey of Engl. Lit.*	3	(3,0)	Minor‡	3	
or Hist 171 Western Civilization	3	(3,0)	AS or MS or Elective	1	
or Hist 172 Western Civilization	3	(3,0)		17	
AS or MS or Elective	1				
	17				

JUNIOR YEAR

Dy Sc 307 Market Milk	3	(2,3)	An Sc 301 Feeds and Feeding	3	(3,0)
Fd Sc 305 Dairy and Food Engr.	3	(2,3)	Dy Sc 306 Ch. & Phys. Nat. of Milk	3	(2,3)
Fd Sc 414 Fd. Qual. Control Lab.	2	(1,3)	Gen 302 Genetics	4	(3,3)
or Dy Sc 310 Dy. Cattle Select.	1	(0,3)	Minor‡	3	
Micro 305 Gen. Microbiology	4	(3,3)	Approved Electives	3 or 4	
Minor‡	6			16 or 17	
	18 or 17				

SENIOR YEAR

Dy Sc 409 Dairy Seminar	2	(2,0)	An Sc 452 Animal Breeding	3	(3,0)
Dy Sc 453 Animal Reproduction	3	(3,0)	or Dy Sc 404 Dairy Plant Mgt.	3	(2,3)
and Dy Sc 455 Animal Reproduction Lab.	1	(0,3)	Dy Sc 410 Dairy Seminar	2	(2,0)
or Dy Sc 402 Dairy Manufac.	4	(3,3)	Dy Sc 452 Dairy Cattle Feeding and Management	3	(2,3)
Nutr 401 Fundamentals of Nut.	3	(3,0)	Micro 402 Dairy Microbiology	3	(2,3)
Minor‡	3		Approved Elective	6	
Approved Elective	5			17	
	17				

134 Total Semester Hours

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* At least one literature course is required.

† To be selected from the following: Pol Sc 301, Psych 201, Soc 201, Phil 201, RS 301.

‡ See class adviser for available minors and course requirements.

POULTRY SCIENCE

The Poultry Science major is expected to gain knowledge in the basic disciplines within which the poultry industry operates and specialized knowledge on the biology of the avian species. Technical poultry courses emphasize the nutrition, physiology, genetics and pathology of domesticated birds and the environmental requirements for incubation of eggs, production of meat and eggs and handling of products.

Minors in *Science, Business, Production, International Agriculture,* or a *Second Department* provide for the specialized interest of the student within the broad area encompassed by Poultry Science.

Job opportunities for Poultry Science majors who minor in *Science* include teaching, extension and research positions in colleges, government laboratories or in industry. This usually involves graduate work. *Business* minors are especially equipped to move into management positions in the small to large corporations in feed manufacturing, production, processing, and marketing of poultry products. *Production* minors are trained for operation of poultry farms, general farms, or as extension agents working with farmers. *International Agriculture* minors are expected to export the technical information and techniques so successful in the American poultry industry to a protein-short world. Many American poultry firms are operating on a worldwide basis and our own government and foreign nations are interested in assistance in transferring poultry knowledge to underdeveloped areas.

Students who hope to work in broad agricultural areas that include poultry and other agricultural segments may find a minor in a *Second Department* helpful. This includes such opportunities as agricultural chemicals, pharmaceuticals, biologicals, feed manufacturers, breeding organizations, marketing organizations, publishers, advertisers, and poultry farmers involved in another enterprise.

ANIMAL INDUSTRIES CURRICULUM

POULTRY SCIENCE MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Econ 201 Principles of Econ.	3	(3,0)
Ch 220 Elem. Org. Chem.*	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.†	3	(3,0)
Engl 203 Survey of Engl. Lit.†	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
or Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Micro 305 Gen. Microbiology	4	(3,3)
Gen 302 Genetics	4	(3,3)	Phys 207 Gen. Physics	4	(3,2)
PS 201 Introd. to Poultry Science	3	(2,3)	PS 356 Incub. and Brooding	2	(2,0)
AS or MS or Elective	1		PS 357 Incub. and Brooding Lab.	1	(0,3)
	18		AS or MS or Elective	1	
				18	

JUNIOR YEAR

An Sc 301 Feeds and Feeding	3	(3,0)	PS 354 Poultry Breeding	3	(2,3)
Engl 301 Public Speaking	3	(3,0)	PS 451 Poultry Nutrition	2	(2,0)
PS 355 Poult. Prod. Grad. & Tech.	3	(2,3)	Dept. Major Requirement¶	3	
Zool 307 Animal Anat. & Physiol.	3	(2,3)	Minor§	6	
Social Science Elective‡	3		Approved Elective	3	
Minor§	3			17	
	18				

SENIOR YEAR

PS 401 Animal Environ. Tech.	2	(2,0)	PS 460 Seminar	2	(2,0)
PS 403 Ani. Environ. Tech. Lab.	1	(0,3)	Dept. Major Requirement¶	3 or 2	
PS 458 Avian Microbiology and Parasit.	4	(3,3)	Minor§	3	
Dept. Major Requirement¶	3		Approved Electives	7 or 8	
Minor§	3			15	
Approved Electives	3				
	16				

134 Total Semester Hours

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* Science minors should substitute Ch 223, 227 for Ch 220. Business minors may substitute Acct 201.

† At least one literature course is required.

‡ To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

§ See class adviser for available minors and course requirements.

¶ See class adviser for department major requirements.

BIOLOGY (Entomology Major)

The Entomology major in the Biology curriculum is described below. See pages 145-149 for other majors in the Biology curriculum.

ENTOMOLOGY

Entomology is that branch of science that deals with the study of insects. In many ways insects are the most important group of animals that affect man. At the present time insects are costing the American public approximately four billion dollars annually. There will always be a need for qualified entomologists and the financial rewards to members of this profession are comparable to those enjoyed by most other scientists.

Depending on training, ability, and interest, entomologists find employment in such areas as the following: (1) research entomologist with several federal agencies, the state experiment stations, or private research foundations; (2) teaching entomology and/or zoology at the college or university level; (3) industrial research and the development of more efficient insecticides; (4) quarantine and regulatory work at both state and federal levels; (5) sales and management for agricultural chemical or the pest control industries; (6) the federal and state extension services; (7) many other specialized areas where a knowledge of insects is essential, such as beekeeping or disease transmission.

BIOLOGY CURRICULUM

ENTOMOLOGY MAJOR

(See page 131 for *Freshman Year* and page 146 for *Sophomore Year*)

Junior Year

First Semester			*Second Semester*		
Ent 401 Field Cr. St. Prod. Insects	3	(2,3)	Ent 402 Fruit, Nut, Veg. Insects	3	(2,3)
Phys 207 Gen. Physics	4	(3,2)	Micro 305 Gen. Microbiology	4	(3,3)
Social Science Elective[*]	3	(3,0)	Phys 208 Gen. Physics	4	(3,2)
Approved Electives[†]	6		Approved Electives[†]	6	
	16			17	

Senior Year

Engl 301 Public Speaking	3	(3,0)	Ent 410 Insect Taxonomy	3	(1,6)
Ent 405 Insect Morphology	4	(3,3)	Ent 462 Seminar	1	(1,0)
Ent 461 Seminar	1	(1,0)	Gen 302 Genetics	4	(3,3)
Pl Pa 401 Plant Pathology	3	(2,3)	Zool 460 Gen. Physiology	3	(2,3)
Zool 304 Animal Ecology	3	(2,3)	Social Science Elective[*]	3	
Approved Electives[†]	4		Approved Electives[†]	4	
	18			18	

135 Total Semester Hours

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[*] To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102, Hist 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

[†] Agron 202 must be included.

FOOD SCIENCE

The Food Science curriculum is designed to prepare students for the many career opportunities in technical and management areas of the food industry. The food industry, being the nation's largest industry, is becoming increasingly technical and requires large numbers of professional food scientists. World food supplies, particularly those rich in protein, are becoming increasingly critical in many parts of the globe. This situation is expected to accelerate the demand for food scientists.

Opportunities for graduates in Food Science include research positions in government organizations and state experiment stations, supervisory, administrative, research, and quality control positions in food processing industries, inspection and grading work with state and federal agencies, consulting, and teaching and extension activities with universities and colleges. Students graduating in Food Science are well prepared to pursue postgraduate training in areas such as microbiology, biochemistry, nutrition, as well as in Food Science.

The student majoring in Food Science will select a minor in *Science, Business, International Agriculture,* or a *Second Department* which will emphasize training in an area other than Food Science and which is designed to supplement the major course of study.

FOOD SCIENCE CURRICULUM

FOOD SCIENCE MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chem.	3	(3,0)	Ch 224 Org. Chem.	3	(3,0)
Ch 227 Org. Chem. Lab.	1	(0,3)	Ch 228 Org. Chem. Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	or Ch 313 Quantitative Analysis	3	(3,0)
Engl 203 Survey of Engl. Lit.[*]	3	(3,0)	and Ch 317 Quant. Anal. Lab.	1	(0,3)
or Hist 171 Western Civilization	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.[*]	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	or Hist 173 Western Civilization	3	(3,0)
Social Science Elective[†]	3		Fd Sc 212 Man's Food Resources	2	(2,0)
AS or MS or Elective	1		Phys 208 Gen. Physics	4	(3,2)
	18		Social Science Elective[†]	3	
			AS or MS or Elective	1	
				17	

JUNIOR YEAR

Fd Sc 305 Dairy and Food Engr.	3	(2,3)	Ch 310 Elem. Biochemistry	4	(3,3)
Fd Sc 311 Food Processing	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Fd Sc 313 Food Processing Lab.	1	(0,3)	Fd Sc 312 Food Processing	3	(3,0)
Micro 305 Gen. Microbiology	4	(3,3)	Fd Sc 314 Food Process. Lab.	1	(0,3)
Minor[‡]	3		Micro 404 Food Microbiology	3	(2,3)
Approved Elective	2		Minor[‡]	3	
	16			17	

SENIOR YEAR

Ex St 301 Introd. Statistics	3	(2,2)	Fd Sc 412 Food Quality Control.	2	(2,0)
Fd Sc 413 Biochem. of Foods	2	(2,0)	Fd Sc 414 Food Qual. Con. Lab.	2	(1,3)
Fd Sc 415 Human Nutrition	2	(2,0)	Fd Sc 416 Food Analysis	2	(1,3)
Minor[‡]	6		Fd Sc 418 Seminar	1	(1,0)
Approved Electives	4		Minor[‡]	3	
			Approved Electives	6	
	17			16	

134 Total Semester Hours

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[*] At least one literature course is required.

[†] To be selected from the following: Hist 102, Soc 201, Phil 201, Pol Sc 301, Psych 201, RS 301.

[‡] See class adviser for available minors and course requirements.

PLANT SCIENCES

The Plant Sciences curriculum includes three majors—Agronomy—Crops and Soils, Horticulture (Fruit and Vegetable), and Horticulture (Ornamental).

AGRONOMY—CROPS AND SOILS

Students relate the agronomy role to proper land use and food for a mushrooming world population. Agronomy is that branch of science dealing with the theory and practice of field crop production and land management. The word "agronomy" is from the Greek noun *agros*—field—and the verb *nemein*—to manage. Trained agronomists may choose an occupation that ranges from the applied (farming) to the abstract (basic research). Agronomists may farm or be employed by the Agricultural Extension Service, the Soil Conservation Service, the U. S. Department of Interior, the Agricultural Research Service and the Food and Drug Administration. In addition, agronomists may find employment in college, university, and high school teaching, in foreign service work, such as the Agency for International Development and in the many allied industries in agriculture.

Students majoring in Agronomy—Crops and Soils will declare a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

AGRONOMY—CROPS AND SOILS MAJOR
(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Agric 201 Introd. to Animal Indus.	3	(2,3)
Ch 220 Elem. Org. Chem.	4	(3,3)	Agron 202 Soils	3	(2,2)
or Ch 223 Org. Chem.	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.[*]	3	(3,0)
and Ch 227 Org. Chem. Lab.	1	(0,3)	or Hist 172 Western Civilization	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Engl 203 Survey of Engl. Lit.[*]	3	(3,0)	Minor[†]	6	
or Hist 171 Western Civilization	3	(3,0)	AS or MS or Elective	1	
or Hist 172 Western Civilization	3	(3,0)		16	
Phys 207 Gen. Physics	4	(3,2)			
AS or MS or Elective	1				
	18				

JUNIOR YEAR

Agron 301 Fertilizers[‡]	3	(3,0)	Agron 308 Soil and Plant Anal.	3	(1,6)
Agron 410 Cotton and Other Fiber Crops[‡]	2	(2,0)	Agron 320 Forage & Pas. Crops[‡]	3	(3,0)
or Agron 411 Grain Crops	2	(2,0)	Agron 322 Forage Crops Lab.[‡]	1	(0,2)
or Agron 412 Tobacco and Spec. Use Crops	2	(2,0)	Agron 410 Cotton and Other Fiber Crops[‡]	2	(2,0)
Bot 352 Plant Physiology	4	(3,3)	or Agron 411 Grain Crops	2	(2,0)
Gen 302 Genetics	4	(3,3)	or Agron 412 Tobacco and Spec. Use Crops	2	(2,0)
Micro 305 Gen. Microbiology	4	(3,3)	Social Science Elective[§]	3	
	17		Minor[†]	6	
				18	

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[*] At least one literature course is required.

[†] See class adviser for available minors and course requirements.

[‡] Required for all students except science minors. Science minors select 13 credits from three courses.

[§] To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

SENIOR YEAR

First Semester			*Second Semester*		
Agron 403 Soil Genesis and Classification[‡]	2	(1,3)	Agron 405 Plant Breeding[‡]	3	(2,2)
Agron 407 Prin. of Weed Control[‡]	3	(2,2)	or Micro 410 Soil Microbiology	3	(2,3)
Agron 455 Seminar	1	(1,0)	Agron 452 Soil Fert. and Mgt.[‡]	2	(2,0)
Minor[¶]	3 — 7		Agron 456 Seminar	1	(1,0)
Approved Electives	6		Approved Electives[¶]	12 — 8	
	15 — 19			18 — 14	

134 Total Semester Hours

[‡] Required for all students except science minors. Science minors select 13 credits from three courses.

[¶] Credit requirements depend upon minor.

HORTICULTURE (Fruit and Vegetable)

This major provides the student with a basic education in science and the humanities, and the application of both in the scientific, technical, and business phases of the fruit and vegetable industry.

Opportunities in this field of study include vegetable and fruit farm management; inspection of fresh fruit, vegetable and other food products as well as nursery stock. There are many other opportunities as in plant breeding, agricultural extension service work, horticultural research, horticultural teaching and writing, and fruit and vegetable processing. Other occupations include sales and field work with seedsmen and nurserymen, and manufacturers of food, fertilizer, and pesticide products.

Students majoring in the fruit and vegetable phase of Horticulture may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

HORTICULTURE (FRUIT AND VEGETABLE) MAJOR

(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agron 202 Soils	3	(2,2)	Agric 201 Introd. to Animal Indus.	3	(2,3)
Ch 220 Elem. Org. Chem.	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.[*]	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Engl 203 Survey of Engl. Lit.[*]	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 171 Western Civilization	3	(3,0)	Ent 301 Elem. and Econ. Ent.	3	(2,3)
or Hist 172 Western Civilization	3	(3,0)	Phys 207 Gen. Physics	4	(3,2)
Hort 201 Gen. Horticulture	3	(2,2)	Approved Electives	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

Gen 302 Genetics	4	(3,3)	Bot 352 Plant Physiology	4	(3,3)
Hort 305 Plant Propagation	3	(2,3)	Hort 302 Prin. Veg. Prod.	3	(2,3)
Hort 352 Commercial Pomology	3	(2,3)	Hort 451 Small Fruit Culture	3	(2,3)
Social Science Elective[†]	3		Micro 305 Gen. Microbiology	4	(3,3)
Minor[‡]	3		Minor[‡]	3	
Approved Electives	3				
	19			17	

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[*] At least one literature course is required.

[†] To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.

[‡] See class adviser for available minors and course requirements.

SENIOR YEAR

First Semester			*Second Semester*		
Hort 405 Nut Tree Culture	2	(2,0)	Hort 410 Seminar	1	(1,0)
Hort 407 Landscape Design	3	(2,3)	Hort 456 Vegetable Crops	3	(3,0)
Hort 409 Seminar	1	(1,0)	Minor‡	6	
Hort 464 Post-Harvest Hort.	3	(2,2)	Approved Electives	4	
Pl Pa 401 Plant Pathology	3	(2,3)		14	
Minor‡	3				
Approved Electives	3				
	18		134 Total Semester Hours		

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‡ See class adviser for available minors and course requirements.

HORTICULTURE (Ornamental)

This major is designed to give students a scientific background and technical facilities in the field of Ornamental Horticulture. Subject matter covers plant materials culture, uses, and planning of ground spaces.

Graduates find careers in nursery work, floriculture, landscape designing, landscape contracting, turf management, and park supervision. Other occupations are as research personnel, teachers, extension workers, and as representatives of fertilizer, machinery, and chemical companies.

Students desiring to major in Ornamental Horticulture may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

HORTICULTURE (ORNAMENTAL) MAJOR
(See page 131 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
AgE 301 Soil and Water Con.	3	(2,3)	Agron 202 Soils	3	(2,2)
Ch 220 Elem. Org. Chem.	4	(3,3)	Engl 204 Survey of Engl. and Amer. Lit.*	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Engl 203 Survey of Engl. Lit.*	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 171 Western Civilization	3	(3,0)	Ent 301 Elem. and Econ. Ent.	3	(2,3)
or Hist 172 Western Civilization	3	(3,0)	Phys 207 Gen. Physics	4	(3,2)
Hort 201 Gen. Horticulture	3	(2,2)	Approved Electives	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

First Semester			*Second Semester*		
Bot 352 Plant Physiology	4	(3,3)	Hort 304 Plant Materials II	3	(2,3)
Gen 302 Genetics	4	(3,3)	Hort 308 Landscape Design	3	(2,3)
Hort 303 Plant Materials I	3	(2,3)	Hort 310 Floriculture	3	(2,3)
Hort 305 Plant Propagation	3	(2,3)	Minor‡	6	
Social Science Elective†	3		Approved Electives	3	
	17			18	

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* At least one literature course is required.
† To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, Soc 201.
‡ See class adviser for available minors and course requirements.

SENIOR YEAR

First Semester		
Hort 408 Floral Design and Retail Marketing	2	(1,3)
Hort 409 Seminar	1	(1,0)
Hort 412 Turf Management	3	(2,3)
Hort 460 Prob. in Landscape Des.	5	(3,6)
Minor‡	3	
Approved Electives	3	
	17	

Second Semester		
Hort 406 Nursery Technology	3	(2,3)
Hort 410 Seminar	1	(1,0)
Pl Pa 401 Plant Pathology	3	(2,3)
Minor‡	6	
Approved Electives	3	
	16	

134 Total Semester Hours

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‡ See class adviser for available minors and course requirements.

PRE-VETERINARY MEDICINE

The curriculum in Pre-veterinary Medicine is designed to meet the general requirements for admission to certain schools of veterinary medicine. Since the requirements for entrance to these schools are not uniform, the student in planning his program should consider the specific requirements of the school he expects to attend. Under the Southern Regional Educational Plan, ten qualified students from South Carolina may enter the School of Veterinary Medicine at the University of Georgia each year. The courses listed below are minimum requirements for all students applying under the Regional Education Board Contract. Only the exceptional student can expect to complete the minimum requirements in four semesters. Students in the entering classes in Schools of Veterinary Medicine now average in excess of three years of Pre-veterinary training.

PRE-VETERINARY MEDICINE CURRICULUM

(See page 131 for *Freshman Year*)

An Sc 201 Introd. to Animal Sc.	2	(2,0)
An Sc 203 Introd. to A. Sci. Lab.	1	(0,3)
An Sc 301 Feeds and Feeding	3	(3,0)
Ch 223 Org. Chemistry	3	(3,0)
Ch 224 Org. Chemistry	3	(3,0)
Ch 227 Org Chemistry Lab.	1	(0,3)
Ch 228 Org. Chemistry Lab.	1	(0,3)
Dy Sc 201 Introd. to Dairy Science	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)
Engl 203 Surv. of Engl. Lit.	3	(3,0)

Gen 302 Genetics	4	(3,3)
Phys 207 Gen. Physics	4	(3,2)
Phys 208 Gen. Physics	4	(3,2)
Pol Sc 301 American Gov. and Pol. Par.	3	(3,0)
PS 201 Introd. to Poultry Science	3	(2,3)
Zool 301 Comp. Vert. Anat.	3	(2,3)
AS or MS or Elective	2	
	46	

79 Total Semester Hours

DIVISION OF BIOLOGY

The biological sciences are concerned with understanding the phenomenon of life, its origin and development, its morphology and classification, its mechanisms and regulations and its procreation and demise. Biology, without question, is relevant to the student in the 1970's, for it assists him in understanding not only himself but all forms of life that are around him.

Academic sections within the Division of Biology offer courses stressing the fundamental structure and unity of life as well as the interrelationships between all components of nature.

Thus, with the fundamentals well established, the developing biologist may choose to complete his undergraduate training in the majors of Botany, Entomology,[††] Microbiology, and Zoology. The curriculum in any one of the four areas will introduce to the student the classical biology or morphology and classification as well as modern biology which seeks to understand the physiochemical bases of the phenomenon of life. Overspecialization will be avoided and instead the choice of subjects will attempt to provide the basic knowledge needed by each student in his chosen career.

Upon the completion of his undergraduate program, the student may choose to become employed in his area of interest or continue his education. If the latter is chosen he should be equipped to enter a professional school, such as a medical college, continue in a graduate biology curriculum; or a graduate program in one of the associated areas, such as bioengineering, biochemistry, biophysics, biomathematics, or one of the areas of agriculture, such as plant or animal breeding, plant pathology, entomology and plant or animal physiology.

[††] See page 140 for Entomology Major.

FRESHMAN AND SOPHOMORE YEAR CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Ch 101 Gen. Chemistry	4	(3,3)	Bot 104 Lab. Exer. in Bot.	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 Gen. Chemistry	4	(3,3)
Math 103 College Algebra	2	(3,0)	Engl 102 English Composition	3	(3,0)
Math 104 Trigonometry	2	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
AS or MS or Elective	1		Zool 102 Prin. of Zoology	2	(2,0)
			Zool 104 Lab. Exer. in Zool.	1	(0,2)
	15		AS or MS or Elective	1	
				18	

Sophomore Year

First Semester			*Second Semester*		
Econ 201 Principles of Econ.	3	(3,0)	Bot 202 Surv. of Pl. Kingdom[*]	4	(3,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Survey of Engl. and Amer. Lit.	3	(3,0)
Zool 201 Invertebrate Zool.[*]	4	(3,3)	Chemistry Elective[‡]	4	
or Zool 202 Vert. Zoology	4	(3,3)	Social Science Elective[§]	3	
Chemistry Elective[†]	4		Approved Electives[¶]	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	15			19	

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[*] Entomology majors substitute Agric 201 for Zool 201 and Agric 202 for Bot 202.

[†] Ch 220 or Ch 223 and 227. Botany majors substitute Phys 207 for Chemistry Elective.

[‡] Ch 224 and 228, Ch 310, or Ch 313 and 317. Botany majors substitute Phys 208 for Chemistry Elective.

[§] To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102, Hist 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

[¶] Students enrolled in the Entomology major must select Ent 301 and students enrolled in the Microbiology major must select Micro 305.

BOTANY

Botany is that portion of Biology dealing with plants, their structure, classification, growth, and development. The Botany major is designed to prepare students for employment as biologists in sales, service, or research in industry or government service. It also provides the background in the fundamental physical and biological sciences necessary for graduate study in the basic and many of the applied plant sciences. Adequate electives are provided so that a student may take additional courses in the area or areas of his special interest.

BIOLOGY CURRICULUM

BOTANY MAJOR

(See page 146 for *Freshman* and *Sophomore Years*)

JUNIOR YEAR

First Semester			*Second Semester*		
Bot 352 Plant Pathology	4	(3,3)	Bot 356 Plant Taxonomy	3	(1,6)
Micro 305 Gen. Microbiology	4	(3,3)	Engl 301 Public Speaking	3	(3,0)
Chemistry Elective[*]	4		Chemistry Elective[†]	4	
Approved Elective[§]	6		Approved Electives[§]	6	
	18			16	

SENIOR YEAR

Bot 406 Plant Anatomy	3	(2,3)	Bot 459 Plant Ecology	3	(2,3)
Gen 302 Genetics	4	(3,3)	Social Science Elective[‡]	3	(3,0)
Social Science Elective[‡]	3	(3,0)	Approved Electives[§]	10	
Approved Elective[§]	7				
	17			16	

134 Total Semester Hours

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[*] Ch 220 or 223 and 227.

[†] Ch 224 and 228, Ch 310, or Ch 313 and 317.

[‡] To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102, Hist 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, RS 301, Soc 201.

[§] Select 9 credits from the following: Agron 405, Bot 404, 457, Gen 451, Micro 401, Pl Pa 401, 405, 456, 458, Zool 458.

MICROBIOLOGY

Microbiology is that discipline of biology concerned with the study of microscopic and sub-microscopic forms of life, which include the bacteria, viruses, yeasts, fungi, protozoa and unicellular algae. The microbiologist seeks to describe these minute life forms in terms of their structures, functions, and processes of reproduction, growth and death at both the cellular and molecular levels. He is also concerned with their interactions and interrelationships with both their animate and inanimate environments, and also with their economic importance to man. To accomplish these goals the microbiologist must be trained in the areas of mathematics, physics, chemistry, and biochemistry in addition to those of microbiology.

The microbiology major offers courses to cover all the areas mentioned above, so that a student graduating from this program is prepared either for entrance to graduate school in the fields of microbiology, biochemistry or bioengineering, or to pursue a career in one of the many industries or public service departments dependent upon microbiology, *e. g.*, the fermentation and drug industries, agriculture, various food industries, medical and public health microbiology.

BIOLOGY CURRICULUM

MICROBIOLOGY MAJOR

(See page 146 for *Freshman* and *Sophomore Years*)

JUNIOR YEAR

First Semester			*Second Semester*		
Engl 301 Public Speaking	3	(3,0)	Gen 302 Genetics	4	(3,3)
Micro 401 Adv. Microbiology	4	(2,6)	Micro 412 Bact. Physiology	4	(3,3)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Approved Electives[*]	6		Approved Electives[*]	5	
	17			17	

SENIOR YEAR

Social Science Elective[†]	3	(3,0)	Micro 411 Pathogenic Bact.	3	(2,3)
Approved Elective[*]	14		Social Science Elective[†]	3	(3,0)
			Approved Electives[*]	10	
	17			16	

134 Total Semester Hours

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[*] Select 12 credits from the following: Bot 451, Micro 402, 404, 410, 413, 414, 415, 416, Pl Pa 456, PS 458, Zool 456.

[†] To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102 Hist 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

ZOOLOGY

Zoology is that aspect of biology which attempts to describe, classify and explore all facets of animal life. The examination of this life would extend from the broad view of the ecologists to the ultra-structural view of the electron microscopists. Of equal importance will be the discussion of historical concepts which have shaped the study of zoology in the past and those of recent origin which characterize modern biology.

The major in Zoology therefore will provide thorough coverage of the fundamentals of zoology, drawing when necessary on the chemical, physical and mathematical as well as philosophical disciplines. The zoology program combines laboratory as well as field exercises in the treatment of vertebrate and invertebrate animals with elective hours available for developing further specific interest areas. On the completion of this major the student should be prepared to continue in graduate studies in several zoological disciplines, enter a medical or dental college, enter the business community in sales or service or serve with a federal or state agency.

BIOLOGY CURRICULUM

ZOOLOGY MAJOR

(See page 146 for *Freshman* and *Sophomore Years*)

Junior Year

First Semester			*Second Semester*		
Ent 301 Gen. Ent.	3	(2,3)	Micro 305 Gen. Microbiology	4	(3,3)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Zool 301 Comp. Vert. Anat.	3	(2,3)	Zool 302 Vert. Embryology	3	(2,3)
Social Science Elective*	3		Social Science Elective*	3	
Approved Electives†	3		Approved Elective†	3	
	16			17	

Senior Year

Engl 301 Public Speaking	3	(3,0)	Gen 302 Genetics	4	(3,3)
Zool 304 Ecology	3	(2,3)	Zool 460 Gen. Physiology	3	(2,3)
Approved Electives†	11		Approved Electives†	10	
	17			17	

134 Total Semester Hours

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* To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102, Hist 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

† Select 6 credits from the following: Bot 404, Ent 405, 410, 455, 461, 462, 468, WB 412, Zool 403, 404, 405, 410, 456, 458, 461.

COLLEGE OF ARCHITECTURE

The Clemson University College of Architecture provides coordinated pre-professional and professional degree programs at undergraduate and graduate levels in preparation for careers in: Architecture, City and Regional Planning and Building Construction. These curriculums are not offered elsewhere in the state. The pre-professional offerings of the College also provide an excellent basis for subsequent graduate studies in Landscape Architecture, Art and Architectural History, Painting and Sculpture.

In addition to the courses and curriculums structured for the professional students of the College, cultural offerings in both lecture and studio courses are available to the general student population and required in certain other schools and colleges.

A rich annual series of exhibitions in the Rudolph Lee Gallery of the College and lectures by figures of international importance in the environmental arts and sciences are presented by the Clemson Architectural Foundation and open to the public. An unusual bond has existed between the architects of the state and region and the College since the first offering of architectural courses to a few students in 1914. The South Carolina Chapter of the American Institute of Architects in 1955 asked that a strong school be established and pledged its continuing unified support of school programs as the prime project of the organization. Sweeping administrative and curricular changes brought a five-year curriculum and full accreditation that year. Following three years of rapid development the College was made an autonomous professional school by action of the Board of Trustees in 1958.

During the decade just ending, the College has sought to select its students with increasing care and to broaden and strengthen its offerings and its faculty. As might be expected, the curriculums and objectives are under continuing study.

To better prepare professional students a two-degree six-year program is required for those majoring in architecture beginning with the entering class of the academic year 1967-68.

The College enjoys contracts for creative research in several areas, and receives an annual support budget from the Clemson Architectural Foundation to enrich its program. It is a member of the Association of Collegiate Schools of Architecture, the Associated Schools of Construction, collaborates with the South Carolina Chapter of the American Institute of Planners, and is accredited by the National Architectural Accrediting Board.

The Architectural Foundation is a nonprofit corporation established in January 1956 under the Laws of the State of South Carolina and under the sponsorship of the South Carolina Chapter of the American Institute of Architects. It was established to facilitate the continuous improvement of architectural education and of the art and technology of building in South Carolina by providing financial and other assistance to the College of Architecture at Clemson University. By this means students in the College of Architecture at Clemson have been able to enjoy instruction, facilities, and conditions equal to those normally found at the nation's best universities.

The advantages to the student evolving from the Clemson Architectural Foundation are many. Among them are the programs of celebrated guest critics and lecturers, excellent exhibits of many types—paintings, sculpture, architecture, construction, furniture, ceramics, textiles and other allied arts and crafts—traveling expenses for student field trips and professional activities, and student loans and grants. Visual-aid facilities and gifts to the library are examples of permanent assets provided through Foundation support.

Intangible but important is the sense of unity and of high purpose resulting from the activities of the Clemson Architectural Foundation which now permeates the entire architectural scene in South Carolina: the architects, their friends in the building industry and the faculty of the College.

The College of Architecture is housed in a modern building constructed for its program in 1958. Space nevertheless is limited and enrollment restricted to students with capacity and motivation. A major addition to the building is projected for early construction. At present the requisite functions are provided on two levels arranged around a central landscaped court. Design studios and the library occupy the entire second level. The first level accommodates the auditorium, classrooms, two art studios, the Exhibition Gallery, and administrative and faculty offices. A ground floor houses shops, photo laboratory, and sculpture studio, jury room and gallery preparations and storage. All areas are air-conditioned.

ENTRANCE REQUIREMENTS

In the interest of both students and the conservation of University resources and to maintain a program on the highest level, admission to the College of Architecture must necessarily be on a selective basis. Annual enrollment quotas are established consistent with space available. Selection considerations include secondary school record and performances in the College Board examination (SAT Test). A personal interview with the Dean should be arranged by the applicant as early as possible in the year before admission.

Applicants for Architecture are required to take the Architectural Aptitude Examination as administered by the Educational Testing Service of Princeton, and although these are not used as criterion for admission, the results are helpful to both the applicant and the admission committee.

Applications for the Aptitude Examination may be obtained from the Educational Testing Service, Princeton, New Jersey 20933. This test is administered at Clemson and other regional testing centers in October, January, and March.

Students wishing admission are advised to make application to the University early in the fall or winter of their senior year in high school and to make arrangements for a personal interview with the Dean of the College as soon as possible. The admissions council of the College will further interview some entering students during freshman matriculation week of each academic year.

THE PROGRAMS OF STUDY

ARCHITECTURE

The architect as a practicing professional has the creative responsibility of designing the buildings which shape our physical environment. To understand the humanistic, economic and technological nature of environmental problems, he must have a sound general education. This professional education must prepare him for a life of continuing change, in which problems to be solved will be large and small, for every sort of function, in every type of climate and for every condition of budget.

The curriculum in architecture is six years in length embracing a four-year Bachelor of Arts in Pre-architecture sequence with a balance of general education and professional study followed by two intensive years of graduate work leading to the first professional degree, Master of Architecture.

BUILDING CONSTRUCTION

The nation's leading industry in terms of annual dollar volume is Building Construction. Building contracting is a dynamic field and although organizations vary considerably in type, size and complexity, those in leadership positions must invariably have capability (education) in management, construction science, relevant technical disciplines, and the humanities. The curriculum in Building Construction has been structured to provide young people with the unique balance of studies needed to equip them for key roles in the industry. There is a tremendous demand for graduates of the curriculum. The course is four years in length and leads to the Bachelor of Science degree in Building Construction.

CITY AND REGIONAL PLANNING

The City Planner is a member of an essential and complex profession concerned with the programming and guiding of urban and regional development. Our expanding society presents unusual opportunities for Planning graduates in private firms and on public agency staffs. When asked what made a good planner, a leading British professional replied, "A sensitive, creative leader who has lived a bit." He must be able to integrate recommendations of a wide range of specialists. The sociologist, economist, traffic engineer and ecologist, plays significant roles in urban growth and change, but the city planner and urban designer must bring the city to physical form with balance and imagination.

Students admitted as candidates for the Master of City and Regional Planning degree must have the following qualifications:

(a) Meet the admissions requirements for the University Graduate School.

(b) Have a baccalaureate degree approved by the school in such fields as: architecture, civil engineering, economics, landscape architecture, law, political science, or sociology.

Candidates entering the curriculum from a non-design discipline will be required to take a special parallel course designed for their needs, and accordingly may be excused from courses in which they have achieved proficiency.

ARCHITECTURE CURRICULUM

BACHELOR OF ARTS IN PRE-ARCHITECTURE

FIRST YEAR

First Semester			*Second Semester*		
Arch 101 Introd. Art and Arch.	3	(0,9)	Arch 102 Introd. Art and Arch.	3	(0,9)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language (Elementary)	3	(3,1)	Modern Language (Elementary)	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

SECOND YEAR

Arch 253 Basic Design I	4	(0,12)	Arch 254 Arch. Design II	4	(0,12)
Engl 203 Survey of Engl. Lit.	3	(3,0)	EM 201 Statics	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. Engl. & Am. Lit.	3	(3,0)
Modern Language (Intermediate)	3	(3,1)	Modern Language (Intermediate)	3	(3,0)
Visual Studies I[*]	2	(0,6)	Visual Studies I[*]	2	(0,6)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

THIRD YEAR

Arch 315 Arch. Hist. I	3	(3,0)	Arch 316 Arch. Hist. II	3	(3,0)
Arch 353 Arch. Design III	5	(0,15)	Arch 354 Arch. Design IV	5	(0,15)
EM 304 Mech. of Materials	3	(3,0)	CE 301 Introd. to Struct. Sci.	3	(2,2)
Engl 301 Public Speaking	3	(3,0)	Elective Group I	6	
Phil 425 Phil. of Sci.	3	(3,0)		17	
	17				

FOURTH YEAR

Arch 331 Arch. Applic. of Comp. Sci.	2		Arch 332 Arch. Applic. of Comp. Sci.	2	
Arch 415 Arch. Hist. III	3	(3,0)	Arch 416 Arch. Hist. IV	3	(3,0)
Arch 453 Arch. Design V	5	(0,15)	Arch 454 Arch. Design VI	5	(0,15)
CE 302 Structural Design I	3	(2,2)	CE 402 Structural Design II	3	(2,2)
Elective Group II	3		Elective Group II	3	
Visual Studies II[†]	2	(0,6)	Visual Studies II[†]	2	(0,6)
	18			18	

137 Total Semester Hours

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[*] Visual Studies I—Two courses of the following are required: Vis 205, 207, 209, 211, 213, 215.

[†] Visual Studies II—Two courses of the following are required: Vis 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316.

Elective Group I—At least six credits must be selected from the following courses: Econ 201, Econ 202, Econ 301, Econ 302.

Elective Group II—At least six credits must be selected from the following courses: Phil 201, 302, 303, Pol Sc 101, 201, 301, Soc 201, 202, 331.

BUILDING CONSTRUCTION CURRICULUM

FIRST YEAR

First Semester			*Second Semester*		
Arch Const 141 Elem. and Bldg. I	4	(2,6)	Arch Const 142 Elem. of Bldg. II	4	(2,6)
Arch 101 Introd. to Art and Arch.	3	(0,9)	Arch 102 Introd. to Art & Arch.	3	(0,9)
Engl 101 English Composition	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Engl 102 English Composition	3	(3,0)
AS or MS or Elective	1		Math 108 Cal. and Lin. Alg.	4	(5,0)
			AS or MS or Elective	1	
	15			18	

SECOND YEAR

Arch Const 241 Elem. of Bldg. III	4	(2,6)	Arch Const 242 Elem. of Bldg. IV	4	(2,6)
CE 201 Surveying	3	(2,3)	EM 201 Statics	3	(3,0)
Econ 202 Prin. of Economics	3	(3,0)	Engl 204 Surv. of Engl. & Am. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	IM 299 Computer Programming I	1	(0,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phil 425 Philos. of Sci.	3	(3,0)
AS or MS or Elective	1		Soc 201 Introd. to Soc.	3	(3,0)
			AS or MS or Elective	1	
	18			18	

THIRD YEAR

Acct 201 Prin. of Accounting	3	(3,0)	Acct 202 Prin. of Accounting	3	(3,0)
Arch Const 341 Bldg. Const. I	4	(2,6)	Arch Const 342 Bldg. Const. II	4	(2,6)
Arch 315 Arch. History I	3	(3,0)	Arch 316 Arch. History II	3	(3,0)
EM 304 Mech. of Materials	3	(3,0)	CE 301 Introd. to Struc. Science	3	(2,2)
IM 312 Commercial Law	3	(3,0)	CE 320 Conc. & Bitum. Materials	2	(1,3)
Soc 351 Industrial Sociology	3	(3,0)	Elective	3	
	19			18	

FOURTH YEAR

Arch Const 441 Bldg. Const. III	4	(2,6)	Arch Const 442 Bldg. Const. IV	4	(2,6)
Arch 415 Arch. History III	3	(3,0)	Arch Const 432 Conc. Form Work	2	(2,0)
Arch 575 Mechanical Plant	2	(2,0)	Arch 416 Arch. History IV	3	(3,0)
CE 302 Structural Design I	3	(2,2)	Arch 576 Mechanical Plant	2	(2,0)
Engl 301 Public Speaking	3	(3,0)	CE 402 Structural Design II	3	(2,2)
Elective	3	(3,0)	Elective	3	
	18			17	

141 Total Semester Hours

COLLEGE OF EDUCATION

The purpose of the College of Education is to prepare teachers, special service personnel, and school leaders; to provide professional services to education in South Carolina; and to carry out basic and applied research in education. Curriculums are organized to give students the opportunities to (1) acquire a broad general education through liberal arts and science courses; (2) develop depth of knowledge in the teaching area; (3) gain an understanding of the historical, philosophical and psychological backgrounds of American Education; and (4) acquire knowledge of and skill and experience in using effective teaching techniques.

Curriculums for those preparing to teach have been especially designed by committees from each department offering a teaching major and the College of Education. The Clemson University Teacher Education Committee, composed of representatives from the teaching-major departments and public-schools, serves in a curriculum advisory capacity to the Dean of the College of Education.

The College of Education offers courses in Aerospace Studies, Agricultural Education, Early Childhood Education, Elementary Education, Industrial Education, Military Science, and Secondary Education.

Programs leading to the Bachelor of Science degree are available in Agricultural Education, Industrial Education, and Science Teaching (Biological Science, Chemistry, Physics, or Mathematics). Students preparing to teach in these fields should register as freshmen in the appropriate curriculum in the College of Education.

Students preparing to teach Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Political Science, Psychology, or Sociology should register in the Bachelor of Arts program in Secondary Education. Those preparing for the elementary level should register for the Bachelor of Arts program in Elementary Education or in Early Childhood Education.

Any student who has been admitted to the University and who is eligible for continuing enrollment may be admitted to the College of Education. However, admission to specific curriculums is selective and requires meeting established criteria. Students who transfer to the College of Education as upperclassmen will be required to meet all the basic requirements for admission to that Education curriculum.

Application to a specific curriculum should be made to the office of the Dean or to the department concerned during the semester preceding that in which the student wishes to obtain admission. Completion of Sc Ed Form 01 and a personal interview are required as part of the application to a specific teacher education curriculum. Sc Ed Form 02, Application for Directed Teaching, should be filed with the faculty adviser no later than May 1 preceding the school year in which student teaching is to be scheduled.

Directed Teaching is on a "block schedule." The other three classes are scheduled to meet during the first half of the semester, and Directed Teaching is scheduled for the last half.

Qualified students who complete a minimum of six semester hours in junior-senior honors courses in Education and a minimum of six semester hours of honors courses in the teaching field may graduate with Departmental Honors.

A student completing at least six semester hours in junior-senior honors courses in Education and a minimum of six semester hours of junior and senior honors courses outside the teaching area may graduate with Senior Division Honors.

BACHELOR OF ARTS CURRICULUMS

EARLY CHILDHOOD EDUCATION

The curriculum in Early Childhood Education leads to a Bachelor of Arts degree in Early Childhood Education. It prepares students for teaching positions in kindergarten or grades 1-3. A minimum of 132 semester hours is required for graduation.

Application to Directed Teaching (Ed 484) should be made in writing no later than May 1 prior to the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

EARLY CHILDHOOD EDUCATION CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 102 American History	3	(3,0)
Hist 101 American History	3	(3,0)	Math 116 Contemporary Math for Elementary Teachers II	3	(3,0)
Math 115 Contemporary Math for Elementary Teachers I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science[*]	3 — 4	
Science[*]	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	17 — 18			16 — 17	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 215 Algebra for Elem. Teach.	3	(3,0)	Math 216 Geom. for Elem. Teach.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Science[*]	4 — 3		Science[*]	4 — 3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

Junior Year

Ed 301 History of American Ed.	3	(3,0)	Ed 334 Child Growth & Devel.	3	(3,0)
Ed 302 Educational Psychology	3	(3,0)	Ed 459 Fund. of Basic Reading	3	(3,0)
Engl 351 Children's Literature	3	(3,0)	Hist 313 S. C. History	3	(3,0)
In Ed 372 Arts and Crafts	3	(2,3)	Social Science Elective[†]	3	
Mus 400 Music in Elementary	3	(3,0)	Electives	5	
Social Science Elective[†]	3				
	18			17	

Senior Year

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 336 Behavior Preschool Child	3	(2,2)	Ed 483 Methods and Materials for Early Childhood Ed.	3	(3,0)
Ed 461 Teaching Read. in Elem.	3	(3,0)	Ed 484 Directed Teaching	6	(1,15)
Ed 466 Curr. for Early Child.	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Elective	3				
	15			15	

132 Total Semester Hours

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[*] Must include Biol 101, Bot 102, 104 or Zool 102, 104, and a two-semester sequence in Chemistry, Geology, Physics or Physical Science.

[†] Economics, Political Science, Sociology, Philosophy, Religion, Geography.

ELEMENTARY EDUCATION

The curriculum in Elementary Education leads to a Bachelor of Arts degree in Elementary Education. It prepares students for teaching positions on the elementary level. Provisions are made for more detailed study in an instructional interest area. A minimum of 132 semester hours is required for graduation.

Application to Directed Teaching (Ed 481) should be made in writing no later than May 1 prior to the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

ELEMENTARY EDUCATION CURRICULUM

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 102 American History	3 (3,0)
Hist 101 American History	3 (3,0)	Math 116 Contemporary Math for Elementary Teachers II	3 (3,0)
Math 115 Contemporary Math for Elementary Teachers I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science*	3 — 4
Science*	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		
	17 — 18		16 — 17

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Hist 171 Western Civilization	3 (3,0)	Hist 172 Western Civilization	3 (3,0)
or Hist 172 Western Civilization	3 (3,0)	or Hist 173 Western Civilization	3 (3,0)
Math 215 Algebra for Elem. Teach.	3 (3,0)	Math 216 Geom. for Elem. Teach.	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
Science*	4 — 3	Science*	4 — 3
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

JUNIOR YEAR

Ed 301 History of American Ed.	3 (3,0)	Ed 302 Educational Psychology	3 (3,0)
Engl 351 Children's Literature	3 (3,0)	Hist 313 S. C. History	3 (3,0)
In Ed 372 Arts and Crafts	3 (2,3)	Social Science Elective†	3
Mus 400 Music in Elementary	3 (3,0)	Interest Area‡	3
Social Science Elective†	3	Electives	5
Interest Area‡	3		
	18		17

SENIOR YEAR
(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 458 Health Education	3 (3,0)
Ed 334 Child Growth & Develop.	3 (3,0)	Ed 480 Methods & Mater. in Elem.	3 (3,0)
Ed 461 Teaching Read. in Elem.	3 (3,0)	Ed 481 Directed Teaching	6 (1,15)
Interest Area‡	6	Mus 210 Music Appreciation	3 (3,0)
	15		15

132 Total Semester Hours

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* Must include Biol 101, Bot 102, 104 or Zool 102, 104, and a two-semester sequence in Chemistry, Geology, Physics or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ Interest Area: 12 semester hours in one of these areas: English, Fine Arts, Mathematics, Modern Languages, Natural Sciences, Social Sciences, Special Education.

SECONDARY EDUCATION

Programs leading to a Bachelor of Arts degree in Secondary Education are available to students preparing to teach Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Political Science, Psychology, or Sociology on the high school level. The teaching field should be selected as early as possible in order that appropriate freshman and sophomore courses may be taken.

Each curriculum requires a major concentration in the teaching field. Specific courses and sequences have been designated by teacher education committees to meet requirements for those planning to teach. Students who have elective courses in the teaching area should consult the departmental adviser prior to scheduling these courses.

The Professional Education courses should be completed in sequence prior to registering for the block schedule. Application to Directed Teaching (Ed 412) should be made in writing no later than May 1 preceding the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for Directed Teaching.

Education 412 is conducted on a full-day basis, "block schedule," for one-half semester. Students taking Ed 412 will register for Ed 424, 458 and Mus 210, these three courses being taught on a five-day basis during the first half of the semester.

SECONDARY EDUCATION CURRICULUMS

TEACHING AREA: ECONOMICS

Freshman Year

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 Western Civilization	3 (3,0)
Hist 171 Western Civilization	3 (3,0)	or Hist 173 Western Civilization	3 (3,0)
or Hist 172 Western Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science[*]	3 — 4
Science[*]	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		
	17 — 18		16 — 17

Sophomore Year

Engl 203 Survey of Engl. Lit.	3 (3,0)	Acct 201 Prin. of Accounting	3 (3,0)
Econ 201 Principles of Econ.	3 (3,0)	Econ 202 Prin. of Economics	3 (3,0)
Math 203 Elem. Stat. Infer.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
Science[*]	4 — 3	Science[*]	4 — 3
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

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[*] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

Junior Year

First Semester			*Second Semester*		
Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	4	
	15			16	

Senior Year

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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† This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior courses consisting of Econ 314, 407; nine semester hours from Econ 302, 403, 404, 410, 412, 420; distributed as follows:

Group A: Econ 314, 407.
Group B: Three courses from these: Econ 302, 403, 404, 410, 412, 420.
Group C: The remaining hours selected from Econ 301, 302, 305, 306, 308, 309, 403, 404, 410, 412, 416, 420, 422, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

TEACHING AREA: ENGLISH

Freshman Year

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	3 — 4	
Science*	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	17 — 18			16 — 17	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Science*	4 — 3		Science*	4 — 3	
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		Elective	2	
			AS or MS or Elective	1	
	14 — 13			16 — 15	

Junior Year

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Hist 361 History of England	3	(3,0)	Hist 363 History of England	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	2	
	18			17	

Senior Year

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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* Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

† Economics, Geography, Political Science, Sociology, Philosophy, Religion.

‡ This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior English courses, and it must include: Engl 304, 352, 402, 404, 405, 422 or 423, 440 and 461 or 462.

Those receiving departmental certification for Engl 304 are required to complete one additional course on the 400 level.

TEACHING AREA: HISTORY

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science[*]	3 — 4	
Science[*]	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	17 — 18			16 — 17	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Science[*]	4 — 3		Science[*]	4 — 3	
Social Science Elective[†]	3	(3,0)	Social Science Elective[†]	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	4	
	15			16	

SENIOR YEAR
(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[‡]	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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[*] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

[†] Economics, Geography, Political Science, Sociology, Philosophy, Religion.

[‡] This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior History courses: Hist 499, 313 and at least one course from Group A and two courses each from Group B and C.

Group I: **Hist 306, 307, 314, 315, 410, 411, 412, 413.**
Group II: **Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 482, 483, 484.**
Group III: **Hist 331, 332, 340, 341, 342.**

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 Western Civilization	3 (3,0)
Hist 171 Western Civilization	3 (3,0)	or Hist 173 Western Civilization	3 (3,0)
or Hist 172 Western Civilization	3 (3,0)	Math 108 Cal. and Lin. Alg.	4 (5,0)
Math 106 Cal. of One Var.	4 (5,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science[*]	3 — 4
Science[*]	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		
	18 — 19		17 — 18

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Math 206 Cal. of Sev. Var.	4 (5,0)	Math 295 Found. of Analysis	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
Science[*]	4 — 3	Science[*]	4 — 3
AS or MS or Elective	1	Social Science Elective[†]	3 (3,0)
		AS or MS or Elective	1
	15 — 14		17 — 16

JUNIOR YEAR

Ed 301 History of American Ed.	3 (3,0)	Arch 303 Eval. of Visual Arts	3 (3,0)
Math 301 Stat. Methods	3 (3,0)	Ed 302 Educational Psychology	3 (3,0)
Math 308 College Geometry	3 (3,0)	Math 408 Topics in Geom.	3 (3,0)
Social Science Elective[†]	3 (3,0)	Math 411 Linear Alg.	3 (3,0)
Elective	3	Elective	4
	15		16

SENIOR YEAR

(Block Schedule—Either Semester)

Ed 335 Adol. Growth & Dev.	3 (3,0)	Ed 412 Directed Teaching[‡]	6(1,15)
Ed 498 Sec. Sch. Reading	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3 (3,0)
Math 412 Introd. to Mod. Alg.	3 (3,0)	Ed 458 Health Education	3 (3,0)
Math Electives	6	Mus 210 Music Appreciation	3 (3,0)
	15		15

128 Total Semester Hours

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[*] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

[†] Economics, Geography, Political Science, Sociology, Philosophy, Religion.

[‡] This semester is a block schedule and must be taken as listed.

Suggested electives: Math 405, 409, 452, 453, 454, Comp Sc 205, 210.

TEACHING AREA: MODERN LANGUAGES (FRENCH, GERMAN, OR SPANISH)

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 Western Civilization	3 (3,0)
Hist 171 Western Civilization	3 (3,0)	or Hist 173 Western Civilization	3 (3,0)
or Hist 172 Western Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science[*]	3 — 4
Science[*]	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		
	17 — 18		16 — 17

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
Science[*]	4 — 3	Science[*]	4 — 3
Social Science Elective[†]	3 (3,0)	Social Science Elective[†]	3 (3,0)
Elective	3	Elective	3
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

JUNIOR YEAR

Ed 301 History of American Ed.	3 (3,0)	Ed 302 Educational Psychology	3 (3,0)
Teaching Major	9	Teaching Major	9
Elective	3	Elective	4
	15		16

SENIOR YEAR

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching[‡]	6(1,15)
Ed 335 Adol. Growth and Dev.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3 (3,0)
Ed 498 Sec. Sch. Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 210 Music Appreciation	3 (3,0)
	15		15

128 Total Semester Hours

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[*] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

[†] Economics, Geography, Political Science, Sociology, Philosophy, Religion.

[‡] This semester is a block schedule and must be taken as listed.

The French teaching major consists of 24 semester hours including Fr 303, 304 and 305. Electives from Fr 306, 307, 308, 403, 404, 405, 406, 407, 408.

The German teaching major consists of 24 semester hours including Ger 303, 304 and 305. Electives from Span 306, 307, 308, 401, 402, 405, 406.

The Spanish teaching major consists of 24 semester hours including Span 303, 304 and 305. Electives from Span 306, 307, 308, 401, 402, 405, 406.

A student desiring to become certified to teach a second Modern Language must complete the third year of the second language.

TEACHING AREA: NATURAL SCIENCES

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Language	3	(3,1)
Language	3	(3,1)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1			17	
	18				

SOPHOMORE YEAR

Biol 101 Prin. of Biology	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Language	3	(3,0)
Language	3	(3,1)	Social Science Elective*	3	
Math 203 Elem. Stat. Infer.	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Social Science Elective*	3		and Bot 104 Lab. Exer. in Bot.	1	(0,2)
AS or MS or Elective	1		or Zool 102 Prin. of Zoology	2	(2,0)
	16		and Zool 104 Lab. Exer. in Zool.	1	(0,2)
			Elective	2	
			AS or MS or Elective	1	
				15	

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Geol 201 Phys. Geol.	4	(3,3)	Geol 202 Hist. Geol.	4	(3,3)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Elective	3		Elective	2	
Science Elective	3		Science Elective	3	
	17			16	

SENIOR YEAR

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Phys 304 Descriptive Astronomy	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Science Elective	3			15	
	15				

129 Total Semester Hours

Science electives to be taken in: Biological Sciences, Chemistry, Physics, Geology. This major will meet all state requirements for certification in Natural Sciences, General Sciences and one Science field.

* Economics, Geography, Political Science, Sociology, Philosophy, Religion.

† The last semester of the senior year is a block schedule and must be taken as listed.

TEACHING AREA: POLITICAL SCIENCE

Freshman Year

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science[*]	3 — 4	
Science[*]	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	17 — 18			16 — 17	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Pol Sc 101 Introd. to Pol. Sc. I	3	(3,0)	Pol Sc 201 Introd. to Pol. Sc. II	3	(3,0)
Science[*]	4 — 3		Science[*]	4 — 3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

Junior Year

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 402 Educ. Psych.	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	4	
	15			16	

Senior Year
(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[†]	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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[*] Biol 102, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Phy Sc 101, 102.

[†] This semester is a block schedule and must be taken as listed.

The teaching major requires twenty-four semester hours of junior and senior Political Science courses.

Pol Sc 101, 201, and 302, plus 21 semester hours in courses drawn from four of the following fields, including one course in comparative government:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433, 434
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372 (Recommended'

TEACHING AREA: PSYCHOLOGY

Freshman Year

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 Engl. Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	3	(3,1)
Modern Language	3	(3,1)	Science*	3 — 4	
Science*	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	17 — 18			16 — 17	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	Modern Language	3	(3,0)
Modern Language	3	(3,1)	Psych 202 Exp. Psych. I	3	(2,2)
Psych 201 General Psychology	3	(3,0)	Science*	4 — 3	
Science*	4 — 3		Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

Junior Year

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educ. Psych.	3	(3,0)
Teaching Major	9		Teaching Major	6	
Elective	3		Social Science Elective†	3	(3,0)
			Elective	4	
	15			16	

Senior Year

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

128 Total Semester Hours

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* Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

† Economics, Geography, Philosophy, Political Science, Religion, Sociology.

‡ This semester is a block schedule and must be taken as listed.

The teaching major requires 24 semester hours of junior and senior courses selected from Psych 302, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 490, 498, Ed 302, 335.

Ed 302 is counted in the teaching area.

TEACHING AREA: SOCIOLOGY

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 Western Civilization	3 (3,0)
Hist 171 Western Civilization	3 (3,0)	or Hist 173 Western Civilization	3 (3,0)
or Hist 172 Western Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Science[*]	3 — 4
Science[*]	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		16 — 17
	17 — 18		

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Math 203 Elem. Stat. Infer.	3 (3,0)	Modern Language	3 (3,0)
Modern Language	3 (3,1)	Soc 202 Social Problems	3 (3,0)
Soc 201 Introductory Soc.	3 (3,0)	Science[*]	4 — 3
Science[*]	4 — 3	Elective[‡]	3
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3 (3,0)	Ed 302 Educ. Psych.	3 (3,0)
Teaching Major	9	Teaching Major	9
Elective[‡]	6	Elective[‡]	5
	18		17

SENIOR YEAR

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching[†]	6(1,15)
Ed 335 Adol. Growth & Develop.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3 (3,0)
Ed 498 Sec. School Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 210 Music Appreciation	3 (3,0)
Elective	2		15
	17		

134 Total Semester Hours

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[*] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Physics, Geology, or Physical Science.

[†] This semester is a block schedule and must be taken as listed.

[‡] Electives must include Econ 201, 202, Phil 201, 302, Pol Sc 301.

The teaching major consists of Soc 411, 421, and the remaining from Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 431, 441, 451, 481, 499.

BACHELOR OF SCIENCE CURRICULUMS

AGRICULTURAL EDUCATION ‡

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations, and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations and agricultural extension; farming, soil conservation and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in business or international agriculture or in one subject-matter field. Students in other departments may minor in Agricultural Education and be certified to teach.

AGRICULTURAL EDUCATION CURRICULUM ‡

FRESHMAN YEAR °

First Semester			*Second Semester*		
Agric 101 Introd. to Agric.	1	(1,0)	Bot 102 Prin. of Botany	2	(2,0)
Biol 101 Prin. of Biology	3	(3,0)	Bot 104 Lab. Exercises in Bot.	1	(0,2)
Ch 101 General Chemistry	4	(3,3)	or Zool 104 Lab. Exer. in Zool.	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Hist 102 American History	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 103 College Algebra	2	(3,0)	Math 104 Trigonometry	2	(3,0)
AS or MS or Elective	1		Zool 102 Prin. of Zoology	2	(2,0)
	17		AS or MS or Elective	1	
				15	

SOPHOMORE YEAR

Agric 202 Introd. to Plant Sciences	3	(2,3)	AgE 205 Farm Shop	3	(2,3)
Ag Ed 201 Introd. to Agric. Ed.	3	(2,2)	AgE 206 Agric. Mechanization	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	Agric 201 Introd. to Animal Indus.	3	(2,3)
Hist 171 Western Civilization	3	(3,0)	Agron 202 Soils	3	(2,2)
or Hist 172 Western Civilization	3	(3,0)	Engl 204 Surv. of Engl. and Amer. Lit§	3	(3,0)
or Engl 203 Surv. of Engl. Lit§	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	or Hist 173 Western Civilization	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

AgE 301 Soil and Water Conserva.	3	(2,3)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Agron 301 Fertilizers	3	(3,0)	An Sc 301 Feeds and Feeding	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	For 307 Elem. of Forestry	3	(2,3)
Approved Horticulture Elective	3		Minor†	9	
Minor†	3			18	
Approved Electives	3				
	18				

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‡ Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

° Horticulture (Ornamental) students take EG 101, Freehand Sketching—1 cr. (0,3), in addition to other courses in the first semester.

§ At least one literature course is required.

† See class adviser for available minors and course requirements.

SENIOR YEAR

First Semester		*Second Semester*	
Ag Ec 452 Agric. Policy	3 (3,0)	Ag Ed 401 Methods in Agric. Education	3 (2,2)
Ent 301 Elem. and Econ. Ent.	3 (2,3)	Ag Ed 406 Directed Teaching	6(0,18)
Hort 407 Landscape Design	3 (2,3)	Ag Ed 422 Introd. to Adult Educ.	3 (2,2)
Pl Pa 401 Plant Pathology	3 (2,3)	Ed 302 Education Psychology	3 (3,0)
Minor†	3		
Approved Electives	3		
	18		15

134 Total Semester Hours

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‡ See class adviser for available minors and course requirements.

INDUSTRIAL EDUCATION

The curriculum in Industrial Education is designed to prepare students for careers in the teaching of industrial subjects and in training programs in industry. To accomplish these purposes the curriculum is divided into three areas of specialization leading to the degree of Bachelor of Science in Industrial Education. At the end of his freshman year, each student will select one of three options: Industrial Arts Education, Vocational-Technical Education, or Education for Industry. Each option requires 135 semester hours of course work.

The Industrial Arts Education option is for those students who desire to teach industrial arts in the secondary schools. Industrial arts is the subject area in the public school system which attempts to provide youth with an interpretation of American industry. It is a general education subject designed to give students exploratory experience in the classroom and laboratory. Majors in this option are qualified for full certification as secondary school teachers of industrial arts.

The Vocational-Technical Education option is designed to prepare teachers of vocational and technical subjects in the Senior High Schools, Area Vocational Schools, and Technical Education Centers. All elective courses in this option will be in an area of specialization or related fields. Teachers graduating from this option will possess the skills and knowledge required to teach the occupation or family of occupation in their area of specialization.

The Education for Industry option is designed to prepare students to enter industry as training specialists. Due to the expansion of technology and industrial development, there is a rapidly increasing demand for training specialists and training directors in industry.

EDUCATION FOR INDUSTRY OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to In. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math Analysis	3	(3,0)	Math 102 Math. Analysis	3	(3,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

SOPHOMORE YEAR

EG 201 Engr. Graph. for In. Ed.	3	(1,6)	Econ 201 Principles of Econ.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 204 Graphic Arts	3	(1,6)
Soc 201 Introd. to Soc.	3	(3,0)	Psych 201 Gen. Psychology	3	(3,0)
Science Elective*	4	(3,3)	AS or MS or Elective	1	
AS or MS or Elective	1		Elective	3	
	17			16	

JUNIOR YEAR

Econ 301 Labor Problems	3	(3,0)	IE 303 Job Evaluation	3	(3,0)
Ed 302 Ed. Psychology	3	(3,0)	IM 415 Managerial Dec. Making	3	(3,0)
IM 307 Personnel Management	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 325 Ind. Org. & People	3	(3,0)
In Ed 303 Electricity	3	(1,6)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Approved Elective‡	3	(3,0)	Approved Elective‡	3	(3,0)
	17			18	

SENIOR YEAR

Engl 301 Public Speaking	3	(3,0)	In Ed 496 Pub. Relations	3	(3,0)
IM 408 Work Simp. & Std.	3	(2,3)	Soc 351 Ind. Soc.	3	(3,0)
In Ed 405 Course Org. & Eval.	3	(3,0)	Approved Elective‡	12	
In Ed 408 Train. Prog. in Ind.	3	(3,0)		18	
Text 460 Textile Processes	3	(3,0)			
Approved Elective‡	3				
	18				

135 Total Semester Hours

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* Science electives to be selected from Chemistry, Physics, Geology, Physical Science, Botany, or Zoology. At least two fields must be represented.

† Social Science electives to be selected from History, Sociology, Economics, Political Science, Religion, or Philosophy.

‡ See class adviser for list of elective courses.

Note: One summer (400 clock hours) of field experience is required of each student following the completion of his sophomore year.

INDUSTRIAL ARTS EDUCATION OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to In. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math. Analysis	3	(3,0)	Math 102 Math. Analysis	3	(3,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

SOPHOMORE YEAR

EG 201 Engr. Graph. for In. Ed.	3	(1,6)	EG 202 Graphic Tech. or In. Ed.	3	(1,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
In Ed 202 Woodworking II	2	(1,3)	In Ed 204 Graphic Arts	3	(1,6)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 205 Power Technology	3	(2,2)
Science Elective*	4	(3,3)	In Ed 313 Arts & Crafts	3	(2,3)
AS or MS or Elective	1		Social Science Elective†	3	(3,0)
			AS or MS or Elective	1	
	16			19	

JUNIOR YEAR

Ed 302 Ed. Psychology	3	(3,0)	Ed 335 Adol. Growth & Develop.	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 314 Basic Electronics	3	(1,6)
In Ed 303 Electricity	3	(1,6)	In Ed 333 Design	3	(2,2)
Social Science Elective†	3	(3,0)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Text 460 Textile Processes	3	(3,0)	In Ed 441 Com. Shop Practices	2	(2,0)
Approved Elective‡	2	(2,0)			
	19			17	

SENIOR YEAR

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 406 Hist. & Phil. of Ed.	3	(3,0)	In Ed 402 Directed Teaching	6	(0,18)
In Ed 405 Course Org. & Eval.	3	(3,0)	In Ed 425 Teaching Ind. Subj.	3	(3,0)
In Ed 416 Des. & Op. In. Ed. Lab.	3	(2,2)	Mus 210 Music Appreciation	3	(3,0)
Approved Elective‡	6	(6,0)			
	18			15	

135 Total Semester Hours

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* Science electives to be selected from Chemistry, Physics, Geology, Biology, Botany, Zoölogy, or Physical Science. At least two fields must be represented, one of which must be in the biological sciences.

† Social Science electives to be selected from History, Sociology, Economics, Political Science, Religion, or Philosophy. At least two fields must be represented, with six, but not more than six hours, in one field.

‡ See class adviser for list of approved electives.

VOCATIONAL-TECHNICAL EDUCATION OPTION

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to In. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math. Analysis	3	(3,0)	Math 102 Math. Analysis	3	(3,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

Sophomore Year

EG 201 Engr. Graph. for In. Ed.	3	(1,6)	EG 202 Graphic Tech. or In. Ed.	3	(1,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
In Ed 202 Woodworking II	2	(1,3)	In Ed 204 Graphic Arts	3	(1,6)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 205 Power Technology	3	(2,2)
Science Elective*	4	(3,3)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SUMMER

In Ed 350 Ind. Cooperative Experience .... 6 cr.

Junior Year

Ed 302 Ed. Psychology	3	(3,0)	Ed 335 Adol. Growth & Develop.	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 333 Design	3	(2,2)
In Ed 303 Electricity	3	(1,6)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Approved Elective (in field of specialization)‡	4	(4,0)	Social Science Elective†	3	(3,0)
	15			15	

SUMMER

In Ed 350 Ind. Cooperative Experience .... 6 cr.

Senior Year

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 406 Hist. & Phil. of Ed.	3	(3,0)	In Ed 402 Directed Teaching	6	(0,18)
In Ed 405 Course Org. & Eval.	3	(3,0)	In Ed 425 Teaching Ind. Subj.	3	(3,0)
In Ed 416 Des. & Op. In. Ed. Lab.	3	(2,2)	Mus 210 Music Appreciation	3	(3,0)
Approved Elective (in field of specialization)‡	3	(3,0)		15	
	15				

135 Total Semester Hours

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* Science electives to be selected from Chemistry, Physics, Geology, Physical Science, Biology, Botany or Zoology. At least two fields must be represented, one of which must be in the biological sciences.

† Social Science electives to be selected from History, Sociology, Economics, Political Science, Religion, or Philosophy. At least two fields must be represented, with six, but not more than six hours, in one field.

‡ See class adviser for list of approved electives.

SCIENCE TEACHING

The program leading to a Bachelor of Science degree in Science Teaching is designed for students planning to teach Mathematics, Biology, Chemistry or Physics and General Science on the secondary school level.

It requires a major concentration in Mathematics, Biological Sciences, Chemistry or Physics. The required science electives are included to give some degree of competency in a field other than the major area.

A student must have a minimum of 130 semester hours of credit for graduation.

TEACHING AREA: BIOLOGICAL SCIENCES

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
Math 103 College Algebra	2	(3,0)	AS or MS or Elective	1	
Math 104 Trigonometry	2	(3,0)			
AS or MS or Elective	1			15	
	16				

Sophomore Year

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Chemistry Elective	4		or Zool 102 Prin. of Zoology	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
AS or MS or Elective	1		Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
			Chemistry Elective	4	
	15		Phys 208 Gen. Physics	4	(3,2)
			AS or MS or Elective	1	
				15	

Junior Year

Bot 202 Surv. of Plant Kingdom	4	(3,3)	Bot 352 Plant Physiology	4	(3,3)
Ed 301 History of Amer. Ed.	3	(3,0)	or Zool 458 Cell Physiology	3	(2,3)
Zool 301 Vertebrate Anatomy	3	(2,3)	Ed 302 Educational Psych.	3	(3,0)
Science Elective	3		Gen 302 Genetics	4	(3,3)
Social Science Elective[*]	3		Micro 305 Gen. Microbiology	4	(3,3)
Elective	3		Social Science Elective[*]	2	
	19			17 or 16	

Senior Year

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[‡]	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Major Electives[†]	6 or 7		Mus 210 Music Appreciation	3	(3,0)
Elective	3			15	
	18 or 19				

130 Total Semester Hours

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[*] Economics, Geography, Philosophy, Political Science, Religion, Sociology.
[†] Botany, Genetics, Microbiology, Zoology.
[‡] Block schedule must be taken as shown.

TEACHING AREA: CHEMISTRY

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			15	

Sophomore Year

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Math 206 Cal. of Sev. Var.	4	(5,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
AS or MS or Elective	1		Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
	15		Phys 208 Gen. Physics	4	(3,2)
			Social Science Elective*	3	
			Elective	3	
			AS or MS or Elective	1	
				17	

Junior Year

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 331 Physical Chem.	3	(3,0)
Ch 313 Quantitative Analysis	3	(3,0)	Ch 339 Physical Chem. Lab.	1	(0,3)
Social Science Elective*	3		Elective	6	
Elective	6			16	
	19				

Senior Year

(*Block Schedule—Either Semester*)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ch 332 Physical Chem.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ch 334 Physical Chem. Lab.	2	(0,6)	Ed 458 Health Education	3	(3,0)
Ch 402 Inorganic Chemistry	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Ed 335 Adol. Growth & Develop.	3	(3,0)		15	
Ed 498 Sec. School Reading	3	(3,0)			
	17				

130 Total Semester Hours

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* Economics, Geography, Philosophy, Political Science, Religion, Sociology.
† Block schedule must be taken as shown.

TEACHING AREA: MATHEMATICS

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective	1	
AS or MS or Elective	1			15	
	16				

Sophomore Year

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Math 206 Cal. of Sev. Var.	4	(5,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
AS or MS or Elective	1		Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
	15		Math 295 Found. of Anal.	3	(3,0)
			Phys 208 Gen. Physics	4	(3,2)
			AS or MS Elective	1	
				14	

JUNIOR YEAR

First Semester			*Second Semester*		
Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Math 301 Stat. Th. & Meth. I	3	(3,0)	Math 408 Topics in Geom.	3	(3,0)
Math 308 College Geometry	3	(3,0)	Math 411 Linear Algebra	3	(3,0)
Science Elective	3		Science Elective	3	
Social Science Elective*	3		Social Science Elective*	3	
Elective	4		Elective	3	
	19			18	

SENIOR YEAR

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Math Elective‡	6	(6,0)			
	18			15	

130 Total Semester Hours

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* Economics, Geography, Philosophy, Political Science, Religion, Sociology.
† Block schedule must be taken as shown.
‡ Suggested electives: Math 405, 409, 452, 453, 454, Comp Sc 205, 210.

TEACHING AREA: PHYSICS

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Math 206 Cal. of Sev. Var.	4	(5,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 221 Therm. and Elect. Phen.	3	(3,0)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
Phys 223 Electron Phys. Lab.	1	(0,3)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
AS or MS or Elective	1		Math 208 Engr. Math. I	4	(5,0)
			Phys 222 Optics and Mod. Phys.	3	(3,0)
			Phys 224 Modern Phys. Lab.	1	(0,3)
			AS or MS or Elective	1	
	15			15	

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Phys 304 Descriptive Astronomy	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Phys 321 Mechanics I	3	(3,0)	Phys 326 Exp. Physics II	4	(2,6)
Phys 325 Experimental Phys. I	4	(2,6)	Phys 341 Electricity & Magnetism	3	(3,0)
Science Elective	3		Social Science Elective*	3	
Social Science Elective*	3				
	19			16	

SENIOR YEAR

(Block Schedule—Either Semester)

Arch 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Phys 455 Quantum Phys. I	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
or Phys 460 Modern Phys.	3	(3,0)			
Elective	4				
	16			15	

130 Total Semester Hours

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* Economics, Geography, Philosophy, Political Science, Religion, Sociology.
† Block schedule must be taken as shown.

COLLEGE OF ENGINEERING

The College of Engineering offers professional curricular programs and programs in both Engineering Analysis and Technical Operations. Each of the programs offered leads to a wide range of career opportunities and serves as preparation for further study at the graduate level.

Professional Curriculums: Six four-year, professional oriented curriculums are offered by the College of Engineering, namely, Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, and Mechanical Engineering. Each of these curriculums is accredited by the Engineers' Council for Professional Development, the recognized national accrediting agency for professional curriculums in engineering. The curriculum in Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

Although the College of Engineering does not offer specific options or majors in each of these professional curriculums, the instruction includes many phases of each respective field. Thus, a Civil Engineering student is graduated in Civil Engineering rather than Structural Engineering, Highway Engineering, Sanitary Engineering, or other such options. However, a student who wishes to study within the areas encompassed by these options will find adequate courses within the Civil Engineering curriculum to prepare himself for work in any of these areas. In the same way the other engineering curriculums include thorough education in various phases of the field of specialization without over-emphasizing one phase to the neglect of others. The professional curriculums lead to a Bachelor of Science degree in the specific professional area.

The courses required in all professional curriculums for the freshman year are as follows:

Freshman Year

First Semester[*]			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engr 101 Engineering Systems ...	0	(1,0)	Engl 102 English Composition ...	3	(3,0)
EG 109 Engr. Graph. Com.	2	(0,6)	Humanistic—Social Elective	3	(3,0)
or Humanistic—Social Elective.	3	(3,0)	or EG 109 Engr. Graph. Com.	2	(0,6)
Engl 101 English Composition ...	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	14 or 15			18 or 17	

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[*] Agricultural Engineering students take Agric 101, Introduction to Agriculture, in addition to other courses in the first semester.

Engineering Analysis Curriculum:† This curriculum is a four-year, engineering science-oriented course of study. Its objectives are two-fold. These are (1) to prepare a student for employment in areas of engineering activity requiring a high level of analytical competency, and (2) to provide a flexible undergraduate preparation for the study of engineering at the graduate level.

The curriculum leads to the Bachelor of Science degree in Engineering Analysis. Requirements for this degree are stated in terms of subject matter area rather than in terms of specific courses. This latitude of course selection permits maximum accommodation of the individual student's interests and career objectives. Degree requirements are as follows:

	Semester Credit Hours
Mathematics (including 12 credits of post-calculus mathematics)	24
Basic Science (including 8 credits of physics)	16
Engineering Science (distributed in at least six engineering science areas)	32
Humanistic-Social Studies	32
Electives	30
AS or MS or Elective	4
	138

The educational objectives of the program will be met by the selection of an area of concentration which will be chosen from several specialty areas offered within the other professional engineering curriculums. The selection of specific courses, particularly in the junior and senior years, will then depend primarily on the choice of the area of concentration.

Maximum flexibility within this program is achieved by permitting a student to defer his choice of specialization until the junior year or later. Such deferral will then allow students from junior and senior colleges not offering engineering to transfer into the program with little or no loss in academic credit.

Technical Operations Curriculum:† This curriculum is a four-year, student-interest oriented course of study designed to prepare technical graduates for such industrial functions as production supervision and management, operation and maintenance of plant environmental and energy systems, and technical sales and purchasing.

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† Additional information on both the Engineering Analysis and the Technical Operations programs is available from the Office of the Dean of Engineering.

The curriculum leads to the Bachelor of Science degree in Technical Operations. Requirements for the degree are as follows:

	Semester Credit Hours
Mathematics	16
Basic Science (including 8 credits of physics)	16
Humanistic-Social	24
Technical Operations	36
Electives	32
AS or MS or Elective	4
	128

The technical operations courses are only offered during the junior and senior years of the program. Hence, a student from a junior college may transfer into the program at the junior level with little or no loss of academic credit.

AGRICULTURAL ENGINEERING*

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The Agricultural Engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

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* The Agricultural Engineering curriculum is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to both the Master of Science and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, an extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

AGRICULTURAL ENGINEERING CURRICULUM

(See page 175 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
AgE 221 Soil and Water Res. Engr. I	3	(2,3)	AgE 212 Fund. of Mechanization	3	(2,3)
EM 201 Engr. Mech. (Statics)	3	(3,0)	Biol 101 Prin. of Biology	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 221 Ther. and Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

AgE 353 Computational Systems	2	(0,6)	AgE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AgE 355 Engr. Anal. and Creat.	2	(1,3)	AgE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
Bot 102 Prin. of Botany	2	(2,0)	Agron 202 Soils	3	(2,2)
Bot 104 Lab. Exer. in Botany	1	(0,2)	EE 320 Electronics I	2	(2,0)
or Zool 104 Lab. Exer. in Zool.	1	(0,2)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
EE 307 Basic Elec. Engr.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
EM 304 Mechanics of Materials	3	(3,0)	Humanistic—Social Elective	3	(3,0)
ME 311 Engr. Thermo. I	3	(3,0)		18	
Zool 102 Prin. of Zoology	2	(2,0)			
	18				

SENIOR YEAR

AgE 431 Agric. Struct. Design	3	(2,3)	AgE 416 Agric. Machinery Design	3	(2,3)
AgE 471 Undergraduate Research	1	(0,3)	AgE 422 Soil & Water Res. Engr. II	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	AgE 442 Agric. Proc. Engr.	3	(2,3)
EM 320 Fluid Mechanics	3	(3,0)	Bot 352 Plant Physiology	4	(3,3)
Math 301 Stat. Theory and Meth. I	3	(3,0)	or Zool 307 Animal Anatomy and Physiol.	3	(2,3)
Approved Elective	3		or Micro 305 Gen. Microbiology	4	(3,3)
	16		ME 304 Heat Transfer	3	(3,0)
			Approved Elective	3 or 4	
				19	

138 Total Semester Hours

CERAMIC ENGINEERING

Ceramic Engineering offers rewarding careers for persons interested in making useful products. The ceramic products range from items important to everyday life, such as brick, cement, and glass to more exotic products, such as ceramic fuel elements for nuclear reactors, ceramic parts for electronic equipment and ceramic nose cones, ceramic heart valves, and other prosthetic parts for medical research. A variety of occupations are available to the ceramic engineering graduate thus making it possible to select a type of work that is compatible with individual preferences. Some graduates work as researchers, developing new ceramic knowledge; others are design engineers, creating new processes or new products; still others are engaged in technical sales, supervision of plant operations or in management.

South Carolina possesses a wide variety of ceramic minerals which rank with forests as the richest natural resources in the State and make it possible for South Carolina to contribute raw materials to every major classification of the ceramic industry. South Carolina has a diversified ceramic industry with plants manufacturing portland cement, glass containers, glass fibers, sewer pipes, brick, refractories, special raw materials, and electronic ceramics.

The curriculum of Ceramic Engineering leads to the degree of Bachelor of Science in Ceramic Engineering, and graduate courses are offered leading to advanced degrees. The course is based on a study of the fundamental courses in chemistry, physics, mathematics, and geology, and advanced courses are designed to apply these fundamental sciences to Ceramic Engineering. Courses in the humanities and social sciences together with courses in engineering sciences form major parts of the curriculum. A large number of elective courses permits the individual student to plan a program that is compatible with his particular interests, talents, and educational goals.

The Ceramic Engineering building and equipment are recognized as outstanding throughout the nation. These facilities were provided by a grant from the Olin Foundation.

CERAMIC ENGINEERING CURRICULUM

(See page 175 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
CrE 201 Introd. to Cer.	2	(2,0)	CrE 202 Materials	3	(3,0)
CrE 204 Lab. Procedures	1	(0,3)	EE 298 Dig. Comp.	1	(1,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Planned Elective	3		Planned Elective	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

JUNIOR YEAR

CrE 304 Exp. Design	1	(0,3)	CrE 302 Thermo. Chem. Cer.	3	(3,0)
CrE 307 Thermal Process.	3	(3,0)	CrE 309 Research Meth.	2	(0,6)
Ch 331 Physical Chem.	3	(3,0)	Ch 332 Physical Chem.	3	(3,0)
EM 201 Engr. Mech. (Statics)	3	(3,0)	EE 330 Systems I	2	(2,0)
Math 301 Statistics	3	(3,0)	EE 331 Workshop I	2	(0,4)
Planned Elective	3		Planned Elective	3	
	16		Free Elective	3	
				18	

SENIOR YEAR

CrE 402 Solid St. Cer.	3	(3,0)	CrE 403 Glasses	3	(3,0)
EE 320 Electronics I	2	(2,0)	ME 304 Heat Transfer	3	(3,0)
EM 304 Mech. of Matls.	3	(3,0)	Planned Electives	13	
Planned Electives	7			19	
Free Elective	3				
	18				

138 Total Semester Hours

Note: 9 credits of Planned Electives must be taken in humanistic-social science courses. 19 credits of Planned Electives should be technical courses selected with the help of class adviser.

CHEMICAL ENGINEERING

The graduate of the science-oriented, research-minded Chemical Engineering Department is finding intellectually stimulating and financially rewarding positions in all phases of modern endeavor. The traditional chemical process industries which produce the industrial chemicals upon which our modern society is based require large numbers of chemical engineers. In addition, because of the fundamental nature of the Chemical Engineering curriculum, the graduate is avidly sought by industries in many areas of specialized technology such as nuclear power, aviation and space, fibers and textiles, pharmaceuticals, pulp and paper, computers, foods, metals, ceramics, instrumentation and automatic control, and petroleum. The chemical engineer is in the forefront of the fight against environmental pollution, and is leading the way in applying engineering technology to the solution of medical and health-related problems.

The Chemical Engineering curriculum is unique in that it is built upon a firm base in three sciences (chemistry, physics, and mathematics), hence the chemical engineer is able to apply scientific knowledge to the solution of problems involving both chemical and physical principles. In chemical engineering courses emphasis is placed upon why things happen as they do and not how; upon enduring principles and not present or past methods. The student is taught to realize that all material things are chemical in nature; hence the chemical engineer, in the practice of his profession, may be called upon to work with anything on the face of the earth. He will be concerned with the conception, design, construction, and management of complete systems of men, processes, computers, and procedures for the most efficient production of chemicals and related products. He produced all the materials required to land men on the moon, he produced uranium to power nuclear reactors, he produced instant foods, he created the synthetic fiber industry, etc. The scope of chemical engineering is broad and the profession is interdisciplinary in nature.

In spite of the strong scientific flavor of the Chemical Engineering curriculum the faculty is constantly striving to impress upon the student that he is studying engineering and not pure science. The ultimate purpose of engineering is to serve mankind by making practical use of scientific and engineering theories and laboratory schemes, thus the engineer must always design his processes to produce products at minimum cost. The chemical engineer in industry must, in brief, be concerned that his company be profitable since it could not exist otherwise.

In industry the chemical engineer may pursue one of two parallel lines of advancement. One path leads to management, and it should be noted that the top managers of most chemical companies are technically educated men. The second and equally rewarding path is in engineering research and development. In this latter category are found the men who have developed the processes and products which shape the modern world in which we live.

The majority of chemical engineers terminate their formal education at the B.S. level, but the Chemical Engineering curriculum also provides an excellent foundation for further education at the graduate level. The most common advanced study path chosen by chemical engineering graduates is continuation in Chemical Engineering to the Master of Science or Doctor of Philosophy degree which provides the added depth of knowledge often required in engineering research and development, as well as the opportunity for specialization. Moreover, the Chemical Engineering graduate, with his excellent background in chemistry, physics, and mathematics as well as in engineering, is well prepared for graduate study in such fields as nuclear engineering, biomedical engineering, environmental engineering, and business and patent law. In addition, by choosing the proper biology courses as electives, the student can receive excellent preparation for entrance into medical or dental schools. Upon receiving their M.D. degree, individuals having chosen chemical engineering as a pre-medical course will be exceptionally well prepared to deal with present and future technological advances in medical practice as well as for work in many research areas.

The Chemical Engineering Department at Clemson is housed in Earle Hall, one of the newest and best equipped buildings for chemical engineering education in the nation. All members of the Chemical Engineering faculty have been educated at the doctoral level and the department offers work leading to the Master of Science and Doctor of Philosophy degrees as well as the Bachelor of Science degree.

CHEMICAL ENGINEERING CURRICULUM

(See page 175 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
ChE 204 Introd. to ChE I	2	(1,3)	ChE 205 Introd. to ChE II	3	(2,3)
Ch 223 Organic Chem.	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
EM 201 Engr. Mech. (Statics)	3	(3,0)	Ch 228 Organic Chem. Lab.	1	(0,3)
Engl 203 English Lit.	3	(3,0)	Comp Sc 210 Algorith. Process. for Engrs.[*]	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Elective	1	(2,1)	AS or MS or Elective	1	(2,1)
	19			18	

JUNIOR YEAR

ChE 301 Unit Op. Theory I	3	(3,0)	ChE 302 Unit. Op. Theory II	3	(3,0)
ChE 307 Analog. Comp.	1	(0,3)	ChE 306 Unit Op. Lab. I	1	(0,3)
Ch 331 Physical Chem.	3	(3,0)	ChE 331 ChE Thermo. I	3	(3,0)
Ch 339 Physical Chem. Lab.	1	(0,3)	Ch 332 Physical Chemistry	3	(3,0)
EE 307 Basic EE	3	(3,0)	Ch 340 Phys. Chem. Lab.	1	(0,3)
EM 304 Mech. of Matls.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Math 309 Engr. Math II	3	(3,0)	Humanistic–Social Elective	3	(3,0)
Free Elective	3				
	20			17	

SENIOR YEAR

ChE 401 Trans. Phen.	3	(3,0)	CrE 419 Engr. Materials	3	(3,0)
ChE 407 Unit Op. Lab. II	2	(0,6)	ChE 410 Unit Op. Theory III	3	(3,0)
ChE 421 Dev., Des. & Op. I	3	(2,3)	ChE 422 Dev., Des., & Opt. II	3	(0,9)
ChE 430 ChE Thermo. II	3	(3,0)	ChE 453 Process. Dynm.	3	(3,0)
ChE 440 Inspection Trip	0		Free Elective	3	
ChE 450 ChE Kinetics	3	(3,0)	Humanistic–Social Elective	3	
Humanistic–Social Electives	6				
	20			18	

144 Total Semester Hours

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[*] Or ChE 210 if offered.

Note: Six credit hours of Advanced MS or AS may be taken as the Free Electives.

Elective Policy. All electives must be chosen from a departmental elective list. A copy of this list may be obtained from the departmental secretary.

CIVIL ENGINEERING

Civil Engineering is the broadest in scope of the engineering professions, being the parent stem from which most of the other branches of engineering have developed. All branches of Civil Engineering rest on a comparatively compact body of principles, in which the students are thoroughly trained in the classroom, the drafting room, the laboratory, and the field. Particular effort is made to develop those qualities essential to success in any field of endeavor and to fit the graduate to become a useful citizen—a good business man as well as a successful engineer.

The practice of civil engineering involves the planning, design, construction, maintenance, and use of large structures and systems to control and improve the environment for modern civilization. The structures may serve many purposes, such as buildings for commerce and industry, bridges for transportation, vehicles for space exploration, or dams for the control and storage of water or for generation of power. The systems provide essential services: water supply; waste water treatment; rail, air, and water transportation; and systems of highways. Projects such as these require that the civil engineer be trained in the social and economic issues as well as in basic science, engineering science, and technology. Though he may specialize in a particular branch of civil engineering, such as structural or transportation, he will need some acquaintance with all subdivisions of civil engineering as well as of other branches of engineering.

The course in Civil Engineering at Clemson University leads to the degree of Bachelor of Science and is planned to equip the graduate with a working knowledge of the above subjects. The student receives early drill in the basic sciences of mathematics, chemistry, and physics, and is introduced gradually to the engineering sciences and the technical courses in civil engineering. By the end of the junior year the student will have had courses in structural design, construction materials, transportation engineering, and soil mechanics. These will enable him to choose technical electives in his senior year in the subdivision of his choice. The non-technical electives are sufficient in number to provide breadth in the arts and humanities, and assure that the graduate has a well-rounded education.

The civil engineering graduate is prepared to work immediately upon graduation in practically any of the areas of the profession. He may find himself in responsible charge at an early date, so every effort is made to train him at Clemson in the ethical standards demanded by the profession. All courses are directed toward the development of initiative, self-reliance, and integrity in the student.

The department is located in Lowry Hall, a modern air-conditioned structure erected in 1958. The laboratories are well equipped, and the classrooms are light and conducive to study. The building has an internal television system and the 220-seat auditorium is one of the most attractive ones on the campus.

CIVIL ENGINEERING CURRICULUM

(See page 175 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
CE 205 Civil Engr. Meth.	2	(1,3)	CE 206 Geometrics	2	(1,3)
EM 201 Statics	3	(3,0)	EM 304 Mech. of Mater.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	EM 305 Mech. of Mater. Lab.	1	(0,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Humanistic–Social Elective[*]	3		Phys 222 Opt. and Mod. Phys.	3	(3,0)
AS or MS or Elective	1		Phys 224 Modern Phys. Lab.	1	(0,3)
			AS or MS or Elective	1	
	19			18	

Junior Year

CE 301 Introd. to Struc. Sc.	3	(2,2)	CE 302 Struc. Desn. I	3	(2,2)
CE 320 Conc. & Bit. Matls.	2	(1,3)	CE 310 Trans. Engr.	4	(3,2)
CE 330 Soil Mechanics	3	(2,2)	Econ 201 Principles of Econ.	3	(3,0)
CE 341 Environ. Engr.	3	(3,0)	EE 330 Systems I	2	(2,0)
EM 202 Engr. Mech. (Dynamics)	3	(3,0)	EE 331 Elect. Cir. Wksp.	2	(0,4)
Math Elective[*]	3		Free Elective[*]	3	
	17			17	

Senior Year

CrE 310 Introd. to Mat. Sc.	3	(3,0)	CE 402 Struc. Desn. II	3	(2,2)
CE 424 Constru. Meth.	2	(2,0)	CE 425 Engr. Relations	3	(3,0)
EM 320 Fluid Mech.	3	(3,0)	EM 421 Hydrol. & Hyd.	2	(2,0)
EM 322 Fluid Mech. Lab.	1	(0,3)	ME 311 Thermodynamics	3	(3,0)
Earth or Life Sc. Elective	3		Free Elective[*]	3	
Humanistic–Social Elective[*]	3		Tech. Elective[*]	3	
Tech. Elective[*]	3			17	
	18		138 Total Semester Hours		

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[*] Each class adviser has a list of approved electives from which students must make selections. Any exceptions to this list must have the approval of the department head.

ELECTRICAL AND COMPUTER ENGINEERING

Electrical and computer engineering is the largest and most diversified of the engineering disciplines. Its technical society membership is more than double that of any other and the responsibilities of the profession range from highly analytical problem solving to detailed design of electronics, communications and computing systems. Electrical and computer engineers have traditionally occupied key positions in a wide variety of engineering programs and their educational program must be structured to allow for this diversity of career objectives. The Electrical and Computer Engineering Department allows this flexibility of course selection in its curriculum. A liberal number of humanistic-social electives provide the graduate with the ability to address himself to both the "how" and the "why" of engineering.

The flexibility of the curriculum allows either a sampling from the many aspects of Electrical and Computer Engineering or a concentration in a specific area. The student's interests and career objectives are carefully considered by the Electrical and Computer Engineering advising staff in structuring a program of study.

Electrical and Computer Engineering can be subdivided into the rather broad areas of networks and systems analysis, communications, electronics, computer science, and power. A brief discussion of each of these follows.

Systems and electric network analysis provides the fundamental core materials in the curriculum. These 18 credits of required work constitute the fundamental studies in analysis and experimentation which receive subsequent further development in elective courses. Computer simulation, mathematical modeling, experimental design and scientific reasoning are representative of the topics covered.

Computers, both analog and digital, are studied extensively in the Electrical and Computer Engineering program. Few areas in engineering present the promise of continued growth that is offered by the computing industry. In preparing the student to meet this challenge, the department offers courses in real-time computing, computer language structures, the theory and design of digital computers, computation and simulation of physical systems, information processing and data handling. The department operates its own digital and analog computing laboratories and has remote terminal equipment to the University Computer Center.

The study of electronics continues to be one of the most active professional areas in Electrical and Computer Engineering. Changes in this field have occurred so rapidly that equipment designed five years ago is obsolete by present design criteria. The vacuum tube gave way to the transistor 16 years ago and just recently the integrated circuit has replaced the discrete solid-state device. The Electrical and Computer Engineering curriculum includes basic work in the theory of operation of solid-state devices, the design of solid-state circuits and the study of integrated circuit technology. Electronic laboratories within the department contain the most modern equipment available for the study of these devices, including special microscopic and micro-manipulation equipment needed in the study of minute integrated circuits.

The study of power systems analysis and energy conversion is carried out in a recently renovated power laboratory. This new facility contains the machinery and instrumentation necessary to explore solid-state-static motor control, dynamic speed and torque measurement techniques and power system stability.

Communication theory may be the most comprehensive field of specialization found in Electrical and Computer Engineering. It includes course work in information theory, electromagnetic theory, switching circuits and electronics. Engineers working in communication find themselves studying switching equipment in tele-communications, working on the plasma blackout problem in missile reentry, studying the design implications of complex missile detection and defense systems or they may be designing antennas and transmitting equipment for space satellites. Some will be trying to comprehend the nature of bioelectricity by studying the human brain.

The Honors Program in the Department of Electrical and Computer Engineering has for the past five years accounted for a large percentage of the honors students in the University. All qualified Electrical and Computer Engineering students are strongly urged to take advantage of this program since it will provide them with an opportunity to participate in some uncommonly rewarding educational experiences during their final two years of study. Honors students receive individualized professional guidance and special laboratory privileges in many of their courses. Honors students in the past have designed electronic devices, have written complex computer programs and have studied technical material which ordinarily would be reserved for students at the graduate level. Students are asked to contact their Electrical and Computer Engineering adviser for more information.

ELECTRICAL AND COMPUTER ENGINEERING CURRICULUM

(See page 175 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
EE 298 Digital Computation	1	(1,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Phys 221 Thermal and Elec. Phen.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Humanistic—Social Elective*	3	
Humanistic—Social Elective*	3		Technical/Humanistic—Social Elective*†	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

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[*] A list of approved humanistic social electives is available from the student's adviser. Any exceptions to this list must be approved in writing by the department head.

[†] A minimum of 6 credits with Electrical Engineering designations are required among the technical electives. A distribution among the engineering sciences of not less than 9 credits is also required.

JUNIOR YEAR

First Semester			*Second Semester*		
EE 320 Electronics I	2	(2,0)	EE 321 Electronics II	2	(2,0)
EE 325 Electronics and Electromagnetics Lab. I	1	(0,2)	EE 326 Electronics and Electromagnetics Lab. II	1	(0,2)
EE 329 Logic & Comput. Devices	3	(2,2)	EE 332 Systems II	2	(2,0)
EE 330 Systems I	2	(2,0)	EE 333 Elec. Circuits W'shop II	2	(0,4)
EE 331 Elec. Circuits Workshop I	2	(0,4)	EE 341 Elec. & Magnetic Fields II	2	(2,0)
EE 340 Elec. and Mag. Fields I	2	(2,0)	Humanistic—Social Elective[*]	3	(3,0)
Math 309 Engineering Math II	3	(3,0)	Technical Elective[†]	3	(3,0)
Technical Elective[†]	3	(3,0)	Free Elective	3	(3,0)
	18			18	

SENIOR YEAR

EE 410 Systems III	3	(3,0)	EE 450 Systems IV	3	(3,0)
EE 411 Elec. Sys. Workshop III	2	(0,4)	EE 451 Systems Design W'shop IV	2	(0,4)
EE 422 Electronics III	2	(2,0)	Humanistic—Social Elective[*]	3	(3,0)
Technical Electives[†]	9	(9,0)	Technical Elective	9	(9,0)
Free Elective	3	(3,0)			
	19		138 Total Semester Hours	17	

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[*] A list of approved humanistic social electives is available from the student's adviser. Any exceptions to this list must be approved in writing by the department head.

[†] A minimum of 6 credits with Electrical Engineering designations are required among the technical electives. A distribution among the engineering sciences of not less than 9 credits is also required.

MECHANICAL ENGINEERING

Mechanical engineers are involved in a variety of industries: aerospace, machinery, textile, chemical, automotive, appliance, and many others. Therefore, their education must be rather broad and not overly specialized. It begins with a thorough preparation in the basic sciences: mathematics, chemistry and physics. This is followed by rigorous study of the engineering sciences: electrical sciences, thermal sciences, mechanical sciences, computers, and systems engineering which is a generalized treatment of automatic control systems.

The program is designed to develop technical competence in the three broad technical areas of Thermal Science, Mechanical Design and Systems Engineering.

The thermal sciences are concerned with energy conversion and heat transfer. The chemical energy of fuels may be converted to other more useful forms to propel high-speed jet aircraft, to provide the thrust for space vehicles, or to operate refrigeration or air conditioning systems. The thermal sciences also involve fluid flow phenomena: supersonic flow, aerodynamics, and flow through turbomachinery.

Mechanical design requires a knowledge of the strength of materials; mechanisms for converting motion; stress, strain, and deflection analyses; automatic control; lubrication theory; and other engineering sciences. It involves the application of the basic and engineering sciences to the creative design of a wide variety of new devices and systems from prosthetic devices for the handicapped to completely automated machines for manufacturing plants.

Systems engineering is an outgrowth of automatic control theory. It involves instrumentation, and both analog and digital computers for the mathematical and experimental analyses of complex physical systems. These systems may be made up of various mechanical, electrical, and hydraulic components. It is the engineering science upon which the field of automation is based.

All of the mechanical engineering laboratories and mechanical design rooms at Clemson are modern and well equipped. A new Analog Computer Laboratory has recently been developed as well as a new Instrumentation Laboratory. All research activities in the department are housed in a new, modern, air-conditioned laboratory building.

In order that mechanical engineering students may obtain a well-rounded education, approximately one-fifth of the program is devoted to subjects in the arts and humanities. Thus, with a broad education in the basic sciences, engineering sciences, and in the humanities, mechanical engineering graduates are prepared for careers in industry, research, development, mechanical design, management or further graduate study.

The Mechanical Engineering Department offers work leading to the Master of Science and the Doctor of Philosophy degrees as well as to the Bachelor of Science degree.

MECHANICAL ENGINEERING CURRICULUM

(See page 175 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
EM 201 Engr. Mech. (Statics)	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math I	4	(5,0)
ME 201 Engr. Design	3	(2,3)	Math 301 Statistics	3	(3,0)
or Math 301 Statistics	3	(3,0)	or ME 201 Engr. Design	3	(2,3)
ME 299 Digital Comp.	1	(0,3)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	Phys 224 Mod. Phys. Lab.	1	(0,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

JUNIOR YEAR

EE 330 Systems I	2	(2,0)	EE 332 Systems II	2	(2,0)
EE 331 Elect. Cir. Workshop	2	(0,4)	ME 304 Heat Transfer	3	(3,0)
EM 304 Mech. of Maters.	3	(3,0)	ME 312 Engr. Thermo. II	3	(3,0)
EM 320 Fluid Mech.	3	(3,0)	ME 314 Engr. Exp.	2	(1,2)
ME 311 Engr. Thermo. I	3	(3,0)	ME 316 Dynamic Sys. Anal.	4	(3,3)
ME 313 Inst. & Meas.	2	(1,2)	ME 321 Fluid Dynamics	3	(3,0)
Free Elective	3			17	
	18				

SENIOR YEAR

First Semester		
CrE 310 Material Sci.	3	(3,0)
ME 401 Prin. of Engr. Des.	3	(3,0)
ME 404 Automatic Control	3	(3,0)
ME 413 ME Lab.	1	(0,2)
Electives	9	
	19	

Second Semester		
ME 402 Engr. Design	3	(1,6)
ME 414 ME Lab.	1	(0,2)
Electives	9	
Free Elective	3	
	16	

138 Total Semester Hours

Elective Policy

12 hours must be Humanistic-Social Electives.
9 hours must be Technical Electives.
Each class adviser has a list of approved electives.

METALLURGICAL ENGINEERING CURRICULUM †

SENIOR YEAR

First Semester		
CrE 410 Analytical Processes	3	(2,3)
CrE 419 Science of Engr. Mats.	3	(3,0)
ChE 430 Chem. Engr. Thermo.	3	(3,0)
MetE 402 Metallurgical Lit.	1	(0,3)
MetE 430 Powder Metallurgy	3	(2,3)
Non-Technical Electives*	6	
	19	

Second Semester		
MetE 408 Heat Treating	3	(2,3)
MetE 425 Senior Thesis	2	(0,6)
MetE 450 Metallic Corrosion	3	(2,3)
Non-Technical Electives*	6	
Technical Elective*	3	
	17	

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* Class advisers have an up-to-date list of approved electives and will suggest course sequences. A minimum of nine credits in the humanities or social sciences must be elected. Any exception to the courses on the list must be approved by the department head.

† This program to be discontinued. No new students admitted after January 1968.

COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources is concerned with the management, use, and stewardship of all of our forest resources and with man's well-being through wise use of his leisure. These two general areas of study offer broad opportunities in the management of our forest and recreation resources for their maximum service to the present and future generations of man.

The College of Forest and Recreation Resources offers curriculums designed to prepare students for professional careers in the following areas.

The Forestry curriculum includes the fundamental and applied sciences needed in the management of the forest environment for its products and services. Forestry prepares graduates for employment as managers and administrators of forest lands for production of timber, water, wildlife, esthetic values, and recreational use.

The Recreation and Park Administration curriculum prepares recreation directors for counties, towns and cities, institutions, industries and youth-serving agencies. A park management emphasis may be pursued leading to a career with federal, state, county, and municipal park systems.

FORESTRY

The Forestry curriculum combines a broad education in liberal arts and the physical, mathematical, and biological sciences with the applied forestry sciences needed in the management of the forest and forest environment for their products and services. Foresters of professional standing are employed in various capacities by private concerns and by federal, state, and other public agencies. Because of the nature of their education, foresters are qualified for a broad spectrum of employment possibilities. They may be engaged as managers, administrators, or owners of forest lands or forest-based businesses; as technical specialists in the production of timber, useable water, wildlife, and esthetic values, and in the recreational use of the forest; or as professionals in other areas where the conservation of our natural resources is a matter of concern. Foresters earning advanced degrees find employment in academic work and in research conducted both by public and private agencies.

The undergraduate curriculum provides a strong program in the basic knowledge and skills required of a professional forester. The curriculum is also designed to provide the necessary prerequisites for those students that desire to continue in graduate study. The Department of Forestry offers graduate programs that lead to a Master of Science or a Master of Forestry degree.

The Forestry curriculum is accredited by the Society of American Foresters.

FORESTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Ch 101 General Chemistry	4	(3,3)	Bot 104 Lab. Exer. in Botany	1	(0,2)
EG 105 Engineering Graphics	2	(0,6)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
For 101 Introd. to Forestry	1	(1,0)	For 102 Introd. to Forestry	1	(1,0)
Math 103 College Algebra	2	(3,0)	Math 106 Calc. of One Variable	4	(5,0)
Math 104 Trigonometry	2	(3,0)	Zool 102 Prin. of Zoology	2	(2,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

SOPHOMORE YEAR

Agron 202 Soils	3	(2,2)	Bot 356 Taxonomy	3	(1,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	CE 201 Surveying	3	(2,3)
For 205 Dendrology	4	(3,3)	Engl 204 Surv. Engl. & Amer. Lit.	3	(3,0)
Math 108 Calc. and Lin. Algebra	4	(5,0)	For 206 Silvics	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	Geol 406 Engineering Geology	3	(2,3)
AS or MS or Elective	1		Phys 208 Gen. Physics	4	(3,2)
	19		AS or MS or Elective	1	
				19	

FORESTRY SUMMER CAMP*

For 251S	Silvics	2 cr.
For 252S	Forest Engineering	2 cr.
For 253S	Dendrometry	4 cr.
For 254S	Forest Products	1 cr.

Junior Year

First Semester			*Second Semester*		
Bot 352 Plant Physiology	4	(3,3)	For 302 Dendrometry	3	(2,3)
Econ 201 Prin. of Economics	3	(3,0)	For 304 Forest Economics	3	(3,0)
Ent 307 Forest Entomology	3	(2,3)	For 306 Wood & Wd. Fib. Ident.	1	(0,3)
Ex St 301 Introd. Statistics	3	(2,2)	For 310 Silviculture	4	(3,3)
For 308 Aerial Photos in For.	3	(2,3)	WB 412 Wildlife Management	3	(2,3)
Social Science Elective	3		Approved Electives	3	
	19			17	

Senior Year

For 417 Forest Regulation	4	(3,3)	Engl 301 Public Speaking	3	(3,0)
For 420 Forest Products	3	(2,3)	For 401 Logging and Milling	4	(2,6)
Pl Pa 405 Forest Pathology	3	(2,3)	For 412 Forest Protection	2	(2,0)
Pol Sci 301 Am. Gov. & Pol. Par.	3	(3,0)	For 414 Management Plans	1	(0,3)
Approved Electives	3		For 416 Forest Pol. and Admin.	2	(2,0)
			For 418 Forest Valuation	3	(3,0)
	16		Approved Electives	3	
				18	

153 Total Semester Hours

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* Students planning to eat in the University Dining Halls are advised to purchase individual meals rather than board plans during summer camp, because several days of travel away from campus can be anticipated during which students will be responsible for their own meals and lodging.

RECREATION AND PARK ADMINISTRATION

The curriculum in Recreation and Park Administration provides training for students who desire to become recreation supervisors and directors and park administrators. Graduates plan and supervise recreation programs in industry, institutions, municipalities and rural communities. The program which leads to a Bachelor of Science degree is designed to provide competencies in recreation administration, management, development, planning, and research. It requires 135 semester hours, including field training during one summer, for completion.

RECREATION AND PARK ADMINISTRATION CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Engl 101 English Composition	3	(3,0)	and Bot 104 Lab. Exer. in Bot.	1	(0,2)
Hist 102 American History	3	(3,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Math 101 Mathematical Analysis I	3	(3,0)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
RPA 101 Introd. to Com. Rec.	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
AS or MS or Elective	1		Engl 102 English Composition	3	(3,0)
			RPA 102 Hist. & Prin. O'door Rec.	3	(3,0)
	16		Soc 201 Introd. to Sociology	3	(3,0)
			AS or MS or Elective	1	
				16	

SOPHOMORE YEAR

First Semester			*Second Semester*		
Engl 203 Survey of Engl. Lit.	3	(3,0)	Acct 201 Prin. of Accounting	3	(3,0)
Physical Science*	4		Engl 204 Survey of Engl. Lit.	3	(3,0)
Psych 201 Gen. Psychology	3	(3,0)	Physical Science*	4	
RPA 204 Sports in Recreation	3	(2,3)	RPA 203 Per. & Comm. Health	3	(3,3)
Zool 102 Gen. Zoology	2	(2,0)	RPA 205 Prog. Plan. for Rec.	3	(2,3)
or Bot 102 Prin. of Botany	2	(2,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			17	

JUNIOR YEAR

Engl 301 Public Speaking	3	(3,0)	Ed 335 Adol. Growth & Develop.	3	(3,0)
Hort 303 Plant Materials I	3	(2,3)	Hort 308 Landscape Design	3	(2,3)
RPA 302 Camp Org. & Admin.	3	(2,3)	RPA 307 Pk. Maint. & Oper.	4	(3,3)
RPA 306 Prin. of Outdoor Rec.	3	(3,0)	RPA 308 Meth. & Tech. Rec. Leadership	3	(3,0)
Elective	3		Elective	3	
	15			16	

SUMMER

RPA 405 Field Training in Recreation 8

SENIOR YEAR

Ag Ec 352 Public Finance	3	(3,0)	For 416 Forest Policy & Admin.	2	(2,0)
Ed 491 Descript. Stat.	3	(3,0)	Pol Sc 302 State & Local Gov.	3	(3,0)
IM 307 Personnel Management	3	(3,0)	RPA 402 Rec. & Park Admin.	3	(3,0)
RPA 403 Facility & Site Planning	3	(2,3)	RPA 404 Meth. of Recreation Res.	3	(3,0)
Elective	3		Soc 331 Urban Sociology	3	(3,0)
			Elective	2	
	15			16	

135 Total Semester Hours

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* Two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

The programs of the College of Industrial Management and Textile Science embrace three major areas, teaching, research, and public service. The College is responsible for six graduate programs (two in cooperation with other administrative units), seven undergraduate programs, and a "non credit" series of professional development courses for business and industry. The undegraduate curriculums are in the areas of Accounting, Administrative Management, Economics, Financial Management, Industrial Management, Textile Science, and Textile Chemistry. These curriculums are designed to prepare the students for a variety of careers, as well as to furnish an education on which to build for a lifetime. The curriculums recognize the need for an understanding of the basic principles of science and appreciation for the nature of human beings, and the comprehension of the economic, political, and social environment. Flexibility in course selection and choice of areas for emphasis is made possible by secondary concentrations and minors as indicated.

ACCOUNTING

This curriculum leads to the Bachelor of Science degree in Accounting. The program of courses is designed to prepare students for professional careers in accounting and management. The major study of accounting is well supported by sequential courses in English, mathematics, management, economics, and sociology.

The graduate in Accounting is well prepared for entrance in law school, graduate school, or the practice of accountancy, either public, private, or governmental. The study of Accounting in preparation for a career in other areas of Management will provide mastery over an essential tool which reinforces experience and judgment in the decision-making process.

ACCOUNTING CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Acct 201 Principles of Acct.	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Science Elective*	4	(3,3)	Science Elective*	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

Sophomore Year

Acct 202 Principles of Acct.	3	(3,0)	Acct 301 Intermediate Acct.	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Math 207 Multidim Cal.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Soc 201 Introd. to Soc.	3	(3,0)	IM 201 Introd. to IM	3	(3,0)
AS or MS or Elective	1		Math 301 Stat. Methods I	3	(3,0)
			AS or MS or Elective	1	
	16			19	

Junior Year

Acct 302 Intermediate Acct.	3	(3,0)	Acct 305 Income Taxation	3	(3,0)
Acct 303 Cost Acct.	3	(3,0)	Engl 304 Advanced Comp.	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 313 Commercial Law	3	(3,0)
IM 306 Corporation Finan.	3	(3,0)	Mgt Sc 311 Econometrics	3	(3,0)
IM 312 Commercial Law	3	(3,0)	Soc 351 Industrial Soc.	3	(3,0)
Approved Elective	3		Approved Elective	3	
	18			18	

Senior Year

Acct 405 Adv. Fed. Tax	3	(3,0)	Acct 407 Acct. Research	1	(1,0)
Acct 410 Bud. and Exec. Cont.	3	(3,0)	Acct 415 Auditing	3	(3,0)
Acct 411 Advanced Acct.	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Mgt Sc 414 Stat. Analysis	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)
Approved Elective	3		IM 415 Mgt. Dec. Making	3	(3,0)
			Approved Elective	3	
	15			16	

132 Total Semester Hours

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* Science elective includes any natural or physical science.

ADMINISTRATIVE MANAGEMENT

The Bachelor of Science degree in Administrative Management is designed for those students interested in careers as professional managers in the less technical areas of management. Such areas include marketing, personnel administration, purchasing, and public administration at the local, state and national levels. In addition, the qualified graduate of this curriculum will have a background suitable for pursuing graduate study in such areas as marketing, transportation, finance, and economics, as well as the behavioral sciences.

The programs of study included in Administrative Management curriculum is designed to provide the student with (1) an appreciation of the social, political and economic environments in which business firms must operate, (2) knowledge of the functional areas of business, their interrelationship and use of analytical methods in solving problems and (3) a facility in the use of mathematics, statistics, and the behavioral sciences in performing managerial functions.

ADMINISTRATIVE MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chem.[*]	4	(3,3)	Ch 102 General Chem.[*]	4	(3,3)
or Acct 201 Prin. of Acct.	3	(3,0)	or Acct 202 Prin. of Acct.	3	(3,0)
Engl 101 English Comp.	3	(3,0)	Engl 102 English Comp.	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	Math 102 Math Analysis II	3	(3,0)
Math 101 Math Analysis I	3	(3,0)	Pol Sc 201 Introd. to Pol. Sci. II	3	(3,0)
Pol Sc 101 Introd. to Pol. Sci.	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	17 or 16			14 or 13	

SOPHOMORE YEAR

Acct 201 Prin. of Acct.	3	(3,0)	Acct 202 Prin. of Acct.	3	(3,0)
Econ 201 Prin. of Econ.	3	(3,0)	or Phys 208 Gen. Physics[*]	4	(3,2)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Econ 202 Prin. of Econ.	3	(3,0)
or Engl 204 Surv. of Engl. and Amer. Lit.	3	(3,0)	IM 201 Introd. to Mgt.	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	IM 299 Computer Prog. I	1	(0,3)
or Phys 207 Gen. Physics[*]	4	(3,2)	Psych 201 Introd. to Psych.	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Soc 202 Social Problems	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16 or 17			17 or 18	

JUNIOR YEAR

Acct 303 Cost Accounting	3	(3,0)	Econ 302 Money and Banking	3	(3,0)
Econ 301 Econ. of Labor	3	(3,0)	IM 308 Marketing Strategy	3	(3,0)
IM 304 Quality Control	3	(3,0)	IM 313 Coml. Law	3	(3,0)
IM 306 Corporate Fin.	3	(3,0)	Pol Sc 321 Gen. Public Adm.	3	(3,0)
IM 312 Coml. Law	3	(3,0)	Soc 331 Urban Sociology	3	(3,0)
			or IM 307 Personnel Mgt.	3	(3,0)
			Elective[†]	3	
	15			18	

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[*] A student may elect either Chemistry or Physics to meet the degree's physical science requirement. If he elects Chemistry he will take Acct 201 and 202 in the sophomore year. If he elects Physics he will take Acct 201 and 202 in the freshman year and Phys 207 and 208 in his sophomore year.

[†] If a student *does not* elect to take Basic ROTC, he may complete the 4 hours of elective credit at any time during his freshman or sophomore year.

SENIOR YEAR

First Semester			*Second Semester*		
Acct 410 Exec. Budget & Con.	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Engl 304 Adv. Composition	3	(3,0)	IM 410 Marketing Research	1	(1,0)
IM 402 Prod. Plan. & Cont.	3	(3,0)	or IM 407 Dir. Research	1	(1,0)
IM 418 Mgt. Information Sys.	3	(3,0)	IM 412 Marketing Anal. II	3	(3,0)
or IM 405 Econ. of Trans.	3	(3,0)	IM 499 Comp. Prog. II	1	(0,3)
Elective[†]	6		IM 415 Manag. Dec. Making	3	(3,0)
			Mgt Sc 414 Stat. Anal.	3	(3,0)
			or IM 404 Managerial Econ.	3	(3,0)
			Elective[†]	6	
	18			17	

132 Total Semester Hours

[†] If a student *does not* elect to take Basic ROTC, he may complete the 4 hours of elective credit at any time during his freshman or sophomore year.

ECONOMICS

The curriculum leading to the Bachelor of Arts degree in Economics is designed to combine a broad general education with a thorough understanding of economics.

The economics curriculum is administered in the College of Industrial Management and Textile Science. Although separate and distinct from the Bachelor of Arts program in the College of Liberal Arts, it shares several ingredients with that program. The two programs share an identical freshman year sequence, identical minor concentrations in most cases, and many of the same approved electives.

The degree requirements, effective for freshmen entering 1967-1968 and thereafter, are given below. The Bachelor of Arts degree in Economics requires 128 semester hours for graduation; and whenever scheduling permits, the student will be required to take the courses in the sequence given. The curriculum shown, however, can be considered adequate preparation for graduate study in economics only if it is taken with the mathematics minor.

ECONOMICS CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 101 Math. Anal. I[*]	3	(3,0)	Math 102 Math. Analysis II[*]	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Natural Science[†]	4		Natural Science[†]	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			17	

SOPHOMORE YEAR

Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Math 203 Elem. Stat. Inference[*]	3	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			17	

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[*] The sequence of Math 101, 102, 203, and 106 may be replaced by Math 106, 108, and 301 or by Math 106, 108, and Ex St 301.

[†] Election of a two-semester sequence of the same science is required.

JUNIOR YEAR

First Semester			*Second Semester*		
Acct 201 Prin. of Accounting	3	(3,0)	Econ 407 Natl. Income and Empl. Anal.	3	(3,0)
Econ 314 Intermed. Econ. Theory	3	(3,0)	Humanities‡	3	
Humanities‡	3		Major	3	
Major	3		Minor§	6	
Minor§	3				
	15			15	

SENIOR YEAR

Major	6	Major	6
Minor	6	Approved Electives¶	10
Approved Elective¶	3		
	15		16

128 Total Semester Hours

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‡ Courses for the Humanities requirement may not be selected from the minor field. Humanities include Art, English, Foreign Language, Music, Philosophy and Religion.

§ Where the student selects a minor which carries prerequisites, the prerequisite courses will be counted as approved electives.

¶ Those seeking teacher certification will be required to complete more than 128 semester hours.

Twenty-four semester hours above the sophomore level are required including Econ 314 and Econ 407. Courses must also include 9 semester hours selected from Econ 302, 403, 404, 410, 412 and 420. The remaining hours may be selected from Econ 301, 302, 305, 306, 308, 309, 403, 404, 410, 412, 416, 420, 421, 422, 424, Ex St 462, Mgt Sci 311, IM 404, 405, 406, and Ag Ec 456. (Econ 314 should be scheduled to follow immediately after Econ 202.)

MINOR CONCENTRATION

A major in economics must select a secondary (minor) concentration from the following:

- Accounting (to include Acct 202, 301, 302, 303, 410)
- Biology
- Chemistry
- English
- Geology
- History
- Mathematics
- Modern Languages
- Philosophy
- Physics
- Political Science
- Psychology
- Sociology

Students who consider the Bachelor of Arts curriculum in Economics and desire to go into secondary school teaching may elect to take the degree in Education with a teaching area in Economics. The courses will be those required for teaching certificates as specified by the South Carolina Department of Education as well as those economics courses required for an Economics major.

Specific requirements for most minors may be found under the section on the College of Liberal Arts and the College of Physical and Mathematical Sciences, Bachelor of Arts curriculum. Requirements for a major in Education with a teaching area in Economics are shown under the College of Education.

A minor in Economics is provided for other degree programs consisting of 15 hours above the sophomore level which must include Econ 314 and 407.

APPROVED ELECTIVES

A list of approved electives for both degree and quality requirements may be obtained from the departmental secretary or from an adviser.

FINANCIAL MANAGEMENT

The curriculum for the Bachelor of Science degree in Financial Management provides the student with a course of study in preparation for a career in such areas as banking, insurance, brokerage and related activities. The student should be well prepared to serve on the financial staff of practically any business firm for the purpose of planning, providing, and controlling the capital of the firm. This curriculum should also prepare the student for service in government and agencies and programs of government. The graduate with this degree should be adequately prepared for entrance in law or graduate school.

The course work consists largely of courses in English, Mathematics, Accounting, Economics, Management, and the Social Sciences. The special interests of the individual student may be pursued through elective credit.

FINANCIAL MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Acct 201 Prin. of Acct.	3	(3,0)	Acct 202 Prin. of Acct.	3	(3,0)
Engl 101 English Comp.	3	(3,0)	Econ 201 Prin. of Econ.	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	Math 102 Math Analysis II[*]	3	(3,0)
IM 201 Introd. to IM	3	(3,0)	Math 102 Math Analysis II	3	(3,0)
Math 101 Math Analysis I[*]	3	(3,0)	Pol Sc 101 Introd. to Pol. Sci.	3	(3,0)
Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

Acct 301 Intermediate Acct.	3	(3,0)	Acct 302 Intermediate Acct.	3	(3,0)
Econ 202 Prin. of Econ.	3	(3,0)	Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Am. Lit.	3	(3,0)
Math 203 Elem. Stat. Inf.[*]	3	(3,0)	Psych 201 General Psych.	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Elective	3	
Elective	1			15	
	16				

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[*] Credits earned in Math 106, 108, 207, 301, and Mgt Sc 414 may be substituted toward Math 101, 102, 203, and eight elective credits. See class adviser.

Junior Year

First Semester			*Second Semester*		
Acct 303 Cost Acct.	3	(3,0)	Acct 305 Income Taxation	3	(3,0)
Econ 306 Risk & Insurance	3	(3,0)	Econ 302 Money and Banking	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 306 Corp. Finance	3	(3,0)
IM 308 Marketing Strategy	3	(3,0)	IM 307 Personnel Mgt.	3	(3,0)
IM 312 Coml. Law	3	(3,0)	IM 313 Coml. Law	3	(3,0)
Soc 351 Indus. Soc.	3	(3,0)	Elective	3	
	18			18	

Senior Year

Acct 410 Bud. & Exec. Cont.	3	(3,0)	Acct 415 Auditing	3	(3,0)
Econ 422 Monetary Theory	3	(3,0)	Econ 412 Interna. Trade	3	(3,0)
Engl 304 Adv. Composition	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
IM 415 Managl. Dec. Making	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Elective	6		Elective	6	
	18			15	

132 Total Semester Hours

INDUSTRIAL MANAGEMENT

This curriculum is designed to adequately prepare students for positions of major responsibility in industry, business, government or further academic study. During the first year education in the mathematical and physical sciences is emphasized. In the second, third, and senior years the student's work expands into the areas of industrial engineering, finance, management and the social sciences. As preparation for careers in professional management, the Industrial Management curriculum is predicated on the philosophy that the individual must manage first himself, coupling this objective with the acquisition of a general education and then acquiring a mastery of the "tools" of management.

INDUSTRIAL MANAGEMENT CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 Gen. Chemistry	4	(3,3)	Ch 102 Gen. Chemistry	4	(3,3)
EG 103 Engr. Com.	3	(1,6)	Engl 102 English Composition	3	(3,0)
or Hist 173 Western Civilization	3	(3,0)	Hist 173 Western Civilization	3	(3,0)
Engl 101 English Composition	3	(3,0)	or EG 103 Engr. Com.	3	(1,6)
IM 100 Introd. to IM	0	(1,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			18	

Sophomore Year

Acct 201 Prin. of Accounting	3	(3,0)	Acct 202 Prin. of Accounting	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Math 207 Multi. Dim. Cal.	3	(3,0)	IM 201 Introd. to IM	3	(3,0)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	IM 299 Computer Pro. I	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Engl 203 Survey of Engl. Lit.	3	(3,0)
Soc 201 Introd. to Soc.	3	(3,0)	or Engl 204 Surv. of Engl. and Amer. Lit.	3	(3,0)
AS or MS or Elective	1		Math 301 Stat. Methods I	3	(3,0)
	17		AS or MS or Elective	1	
				17	

Junior Year[*]

First Semester			Second Semester		
Acct 303 Cost Accounting	3	(3,0)	IM 304 Quality Control	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 308 Marketing Strategy	3	(3,0)
IE 307 Survey of Engr.	3	(3,0)	Mgt Sc 311 Introd. to Econ.	3	(3,0)
IM 322 Legal Env. of Bus.	3	(3,0)	Soc 351 Indus. Soc.	3	(3,0)
Area Concentration	3		Area Concentration	3	
Elective	3		Elective	3	
	18			18	

Senior Year

Acct 410 Bud. and Exec. Cont.	3	(3,0)	IM 402 Op. Plan. and Cont.	3	(3,0)
Engl 304 Adv. Composition	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)
IM 408 Work Simp. & Stand.[‡]	3	(2,3)	IM 407 Directed Research[§]	1	(1,0)
or IM 418 Mgt. Inform. Sys.	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Mgt Sc 414 Stat. Analysis	3	(3,0)	IM 415 Mgt. Dec. Making	3	(3,0)
Area Concentration	3		IM 499 Computer Prog. II	1	(0,3)
	15		Area Concentration	3	
				14	
			132 Total Semester Hours		

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[*] Industrial Management majors are expected to begin their area concentrations in the junior year.

[§] Students electing the Marketing concentration may substitute IM 410 for IM 407.

[‡] Students selecting the IE area concentration will normally take IM 408.

Area Concentrations

During the junior and senior years the student is required to select courses from *one* of the following areas for the purpose of emphasizing a particular area of the curriculum. Area concentrations constitute 12 credits and may be extended to 18 credits with the approval of the student's major adviser.

A. Ceramics
B. Economics
C. Defense Studies
D. Health and Hospital Administration
E. Human Resources Management
F. Industrial Engineering
G. Industrial Statistics
H. Management Science
I. Marketing Analysis
J. Regional Science
K. Textiles

TEXTILE CHEMISTRY

The Textile Chemistry curriculum prepares students for a wide variety of positions in the textile-fiber-polymer complex of industries that provide so much of the industrial income of the Southeast. The program gives excellent preparation for graduate study in many fields including the sciences, engineerings, management, and the interdisciplines such as textile, fiber, and polymer science. In his first two years, the student acquires the firm foundation in chemistry, physics, mathematics, and English essential to any serious study of science. In his third and fourth years, the student continues his studies of chemistry and begins to apply his knowledge in studies of polymer and fiber science, dyeing, finishing, yarn and fabric formation, and textile structures. Supporting courses in the humanities, English, and economics are included.

A total of 132 semester hours is required for graduation; of these, 32 semester hours are electives which may include up to ten semester hours of Air Science or Military Science. At least 20 semester hours of electives will form a coherent group in an area of particular interest and need to the student in his scientific and professional development. Ordinarily these courses will be junior or senior level courses in textile science, textile chemistry, other sciences, engineering, mathematics, or management. In the second semester of his sophomore year, the student, with the advice and consent of the Head of the Textile Department or the Director of Undergraduate Textile Education, will develop a study plan and will select these elective courses so as to maximize his training and development in his chosen field of study.

Senior students are encouraged to participate in original research and seminar programs. These activities, for which academic credits are given, introduce the student to scientific research and development in the chemistry of textiles, fibers, and polymers.

The Textile Department offers the degree, Master of Science in Textile Chemistry, and, in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

TEXTILE CHEMISTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	IM 299 Comp. Program. I	1	(0,3)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Text 122 Introd. Textiles	1	(1,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 225 Org. Chem. Lab.	2	(0,6)	Ch 226 Org. Chem. Lab.	2	(0,6)
Engl 203 Survey of Eng. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
or Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Elective	2	
Phys 223 Electron Phys. Lab.	1	(0,3)	AS or MS or Elective	1	
AS or MS or Elective	1				
	17			16	

Junior Year

First Semester			*Second Semester*		
Ch 331 Physical Chemistry	3	(3,0)	Ch 332 Physical Chemistry	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Engl 304 Adv. Composition	3	(3,0)
TC 315 Introd. Poly. Sci. & Engr.	3	(3,0)	TC 316 Chem. Prep. of Text.	3	(2,3)
TC 317 Polymer & Fiber Lab.	1	(0,3)	Text 306 Yarn Formation	3	(2,3)
Electives *	6		Electives *	6	
	16			18	

Senior Year

TC 457 Dyeing & Fin. I	3	(3,0)	TC 458 Dyeing & Fin. II	3	(3,0)
TC 459 Dyeing and Fin. Lab.	1	(0,3)	TC 460 Dyeing and Fin. Lab.	1	(0,3)
Text 313 Fabric Formation	3	(2,3)	Text 322 Prop. of Text. Structure	3	(2,3)
Text 321 Fiber Science	3	(2,3)	Electives *	10	
Electives *	6			17	
	16				

132 Total Semester Hours

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* Class advisers have lists of approved electives and will suggest sequences of courses.

TEXTILE SCIENCE

The Textile Science curriculum prepares students for a wide variety of positions in research and development, production, standards, and management in the textile-fiber-polymer complex of industries and in related industries. The program gives excellent preparation for graduate study in many fields. The first two years are devoted to the study of the chemistry, physics, mathematics, and English essential to the study of textile, fiber, and polymer science. In his third and fourth years, the student studies the science and technology necessary for development and production of fibers, yarns, woven, and non-woven textile structures, and synthetic polymers.

A total of 132 semester hours is required for graduation; of these, 34 semester hours are electives which may include up to ten semester hours of Air Science or Military Science. At least 20 semester hours of electives will form a coherent group in an area of particular interest and need to the student in his scientific and professional development. Ordinarily these courses will be junior or senior level courses in textile science, textile chemistry, other sciences, engineering, mathematics, or management. In the second semester of his sophomore year, the student, with the advice and consent of the Head of the Textile Department or the Director of Undergraduate Textile Education, will develop a study plan and will select these elective courses so as to maximize his training and development in his chosen field of study.

Senior students are encouraged to participate in original research and seminar programs. These activities, for which academic credits are given, introduce the student to scientific research and development in textiles, fibers, and polymers.

The Textile Department offers the degree, Master of Science in Textile Science, and, in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

TEXTILE SCIENCE CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	IM 299 Comp. Program. I	1	(0,3)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Text 122 Introd. Textiles	1	(1,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

Sophomore Year

Engl 203 Survey of Eng. Lit.	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
TC 303 Text. Chemistry	3	(3,0)	TC 304 Text. Chemistry	3	(3,0)
TC 305 Text. Chem. Lab.	1	(0,3)	TC 306 Text. Chem. Lab.	1	(0,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

Junior Year

Text 301 Fiber Processing I	3	(2,3)	Engl 304 Adv. Composition	3	(3,0)
Text 311 Fabric Development I	3	(2,3)	Text 302 Fiber Processing II	3	(2,3)
Text 321 Fiber Science	3	(2,3)	Text 312 Fabric Development II	3	(2,3)
Electives [*]	9		Text 322 Prop. of Text. Struct.	3	(2,3)
	18		Electives [*]	6	
				18	

Senior Year

TC 315 Introd. Poly. Sci. & Engr.	3	(3,0)	TC 458 Dyeing and Fin. II	3	(3,0)
TC 317 Polymer & Fiber Lab.	1	(0,3)	TC 460 Dyeing and Fin. Lab.	1	(0,3)
Text 403 Fiber Processing III	3	(2,3)	Text 414 Nonwoven & Knit Struct.	3	(3,0)
Text 411 Fabric Development III	3	(2,3)	Electives [*]	9	
Electives [*]	6			16	
	16		132 Total Semester Hours		

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[*] Class advisers have lists of approved electives and will suggest sequences of courses.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts, in addition to its six major curriculums leading to the degree of Bachelor of Arts, furnishes indispensable services to all other divisions of the University, including nearly all the instruction in the humanities and the social sciences. Major concentrations may be elected in English, History, Modern Languages, Political Science, Psychology, and Sociology; minor concentrations are offered in these disciplines and in Philosophy. In cooperation with other Colleges of the University, minor concentrations are also available in Biology, Chemistry, Economics, Fine Arts, Geology, Mathematics, and Physics. Supporting work is offered in Music and in interdisciplinary humanistic studies.

The College of Liberal Arts offers programs leading to graduate degrees in English and in History.

BACHELOR OF ARTS CURRICULUM

GENERAL INFORMATION

The curriculum leading to the degree of Bachelor of Arts is designed to meet the needs of students who desire a broad general education, with emphasis upon the humanities and the social sciences, as a preparation for intelligent citizenship, for general commercial and industrial life, for government service, and for teaching. This curriculum also provides excellent background for the study of law or journalism.

As soon as feasible in his college career, and not later than the end of his sophomore year, the student seeking the Bachelor of Arts degree will select a major and a minor field of concentration from the following areas:

Major

English
History
Modern Languages
Political Science
Psychology
Sociology

Minor

Biology
Chemistry
Economics
English
Fine Arts
Geology
History
Mathematics
Modern Languages
Political Science
Philosophy
Physics
Psychology
Sociology
"Cluster Minor"

To fulfill requirements for a major concentration, a student takes 24 semester hours credit from courses above the sophomore level, including certain courses specified by the major department; the minor concentration requires 15 credits from courses above the sophomore level, including certain specified courses.

The total number of semester credits required for the degree is 128; of these, at least 12 should be earned in humanities courses numbered 300 or higher, and at least 12 in Social Sciences courses numbered 300 or higher. The humanities are for this purpose considered to include Art, English, Languages, Music, Philosophy, and Religion as well as courses entitled Humanities; the Social Sciences are here considered to include Economics, Geography, History, Political Science, Psychology, and Sociology.

Students in the Bachelor of Arts program who expect to teach in the public schools may elect Education courses required for teaching certificates by the South Carolina State Department of Education, such courses to be approved by their own departmental advisers.

BACHELOR OF ARTS DEGREE

BASIC CURRICULUM

FRESHMAN YEAR

First Semester		*Second Semester*	
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Hist 171 Western Civilization	3 (3,0)	Hist 172 Western Civilization	3 (3,0)
or Hist 172 Western Civilization	3 (3,0)	or Hist 173 Western Civilization	3 (3,0)
Math 101 Math Analysis	3 (3,0)	Math 102 Math Analysis	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,1)
Natural Science[*]	3 or 4	Natural Science[*]	3 or 4
AS or MS or Elective	1	AS or MS or Elective	1
	16 or 17		16 or 17

SOPHOMORE YEAR

Engl 203 English Literature	3 (3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3 (3,0)
Modern Language	3 (3,1)	Modern Language	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
Approved Electives	9	Approved Electives	9
	16		16

JUNIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	12
Humanities or Social Sciences	3	Humanities or Social Sciences	3
Approved Electives	5 or 3	Approved Electives	3
	17 or 15		18

SENIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	9
Humanities or Social Sciences	3	Humanities or Social Sciences	3
Approved Electives	3 or 2	Approved Electives	2 or 3
	15 or 14		14 or 15

128 Total Semester Hours

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[*] A two-semester sequence of the same science (Chemistry, Physics, Geology, or Physical Science) *or* Biol 101 and Zool 102, 104 or Bot 102, 104.

MAJOR CURRICULUMS IN THE COLLEGE OF LIBERAL ARTS

ENGLISH

For a *major* concentration in English, the recommended program of study consists of the courses stipulated in the basic curriculum and 24 semester hours of English, arranged as follows:

Group I—Engl 402 or 404, 405, 422 or 423 or 424.

Group II—Nine semester credits according to one of the following plans:

- (A) Engl 461; 425 or 427 or 429 or 431, or 437; 416 or 438 or 439.
- (B) Engl 462; 409 or 443; 445 or 446.
- (C) Engl 461, 462, and one of these courses: 409, 416, 425, 427, 429, 431, 437, 438, 439, 443, 445.

Group III—Six additional semester credits from courses numbered above 400.[*]

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required. English majors are expected to complete Hist 361, 363, and to complete the third year of a foreign language or the second year of two foreign languages. Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

HISTORY

The recommended program of study consists of the required courses in the Bachelor of Arts curriculum plus Hist 101, 102, Econ 201, Phil 201 or 312, the completion of the third year of a modern foreign language, Hist 499, and 21 additional semester credits in History, arranged as follows:

Group I—At least six credits from these courses: Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—At least six credits from these courses: Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484. 9

Group III—At least six credits from these courses: Hist 331, 332, 340, 341, 342.

History majors become eligible to take Hist 499 when they have completed 96 semester hours and at least 5 courses in history at the 300-400 level (excluding Hist 301).

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

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[*] English 332 may be included in this group by special arrangement with the Head of the Department of English.

MODERN LANGUAGES

A student may elect a major concentration in a single language or a concentration split between two languages.

I. The recommended program of study for a major in French, German, or Spanish consists of the courses stipulated in the basic Liberal Arts curriculum and 24 hours in the language arranged as follows: 303, 304, 305, and either 306, 307, or 308, plus 12 semester hours on the 400 level.

II. The recommended program for a split major in Modern Languages consists of the courses stipulated in the basic Liberal Arts curriculum, 18 semester hours in the primary language, and 12 semester hours in the secondary language, arranged as follows:

Primary Language. 303, 304, 305, and either 306, 307, or 308 plus 6 semester hours on the 400 level.

Secondary Language. 12 semester hours from courses numbered higher than 300.

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

POLITICAL SCIENCE

For a major concentration in Political Science, the recommended program of study consists of the required courses in the Bachelor of Arts curriculum; Pol Sc 201; Pol Sc 101 (formerly 202) *or* 301; Ex St 301; and 24 semester hours of Political Science drawn from at least four of these fields:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433, 434
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372, 473

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

PSYCHOLOGY

The recommended program of study for a major concentration in Psychology consists of the required courses in the Bachelor of Arts curriculum, Psych 201 and 202, Math 203 or Ex St 301, Psych 363, and 21 additional hours of Psychology drawn from the following courses:

Psych 302, 321, 331, 341, 351, 361, 363, 380, 401, 402, 403, 422, 471, 490, 498, 499, and Comp Sc 205.

Additional approved electives are added as needed to meet the minimum of 128 semester hours required for graduation.

SOCIOLOGY

The recommended program of study for a major concentration in Sociology consists of the required courses in the Bachelor of Arts curriculum, Soc 201 202, Econ 201, 202, Phil 201, 302, Pol Sc 301, Ex St 301, Soc 411, 421, and 18 additional hours drawn from these courses: Pol Sc 341, RS 359, Soc 306, 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499. Additional approved electives will be added to meet the minimum of 128 semester hours required for graduation.

MINOR CONCENTRATIONS

Students seeking the Bachelor of Arts degree may choose one of several minor concentrations available. The requirements for each area are detailed below.

Biology. A minor concentration in Biology requires 15 semester credits in the biological sciences numbered higher than 200.

Chemistry. A minor concentration in Chemistry requires Ch 101, 102, and 15 additional credits in chemistry, the courses to be selected in consultation with the Department of Chemistry.

Economics. A minor concentration in Economics requires Econ 201, 202, 314, 407, and 9 credits from these courses: Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

English. A minor concentration in English requires 15 semester credits in English above the sophomore level, arranged as follows:

Group I—Engl 405 and either 422 or 423.

Group II—One of these courses: Engl 402, 404, 425, 427, 429, 431, 437, 443, 445, 446, 461, 462.

Group III—Six additional credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts consists of Hum 201-202 or Arch 101-102 and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected:

Arch 303, 315, 316, 415, 416, all 500 courses;
Engl 305, 308, 310, 311, 331, 332, 333;
Hum 203;
Mus 151, 152, 205, 206, 210, 315, 316, 362, 365, 411;
Phil 305;
Visual Studies (all courses).

Geology. A minor concentration in Geology requires 15 semester credits from the following courses: Geol 201, 202, 306, 307, 309, 311, 402, 403, 404, 411, 412.

History. A minor concentration in History requires Hist 101, 102, and 15 additional credits in History, including at least one course from each of these groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342.

Mathematics. A minor concentration in Mathematics requires Math 106, 108, 206, and 9 additional credits in mathematics, including at least two of these courses: Math 208, 295, 301, Comp Sc 205, 311, and any 400-level course in Mathematics or Computer Science.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300, including at least one course on the 400 level.

Philosophy. A minor concentration in Philosophy requires Phil 201, 302, and 15 semester credits from the following courses: Phil 211, 303, 304, 305, 309, 312, 318, 322, 344, 422, 425.

Physics. A minor concentration in Physics requires Phys 122 and 15 additional semester credits in Physics, including Phys 221, 222.

Political Science. A minor concentration in Political Science requires Pol Sc 101 (formerly 202) or 301; 201, and 15 additional semester credits selected from at least three of the fields of Political Science listed above under the major curriculum for Political Science.

Psychology. A minor concentration in Psychology requires Psych 201, 202, and 15 semester credits from the following courses; Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 498; Ed 302 and 335 (if taken prior to fall 1968); Comp Sc 205.

Sociology. A minor concentration in Sociology requires Soc 201, 202, and 15 semester credits from the following courses: Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499, Pol Sc 341, RS 359.

The *"Cluster Minor."* This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the "Cluster Minor" is 15 semester credits in courses numbered higher than 300 (except where noted differently), chosen according to one of the plans listed below. Courses within the student's major area may not be included in the Cluster Minor.

- Group I—Social Sciences[*]
    - Economics
    - History
    - Political Science
    - Psychology
    - Sociology
- Group II—Philosophy and Religion
- Group III—Administration[*]
    - Accounting
    - Economics
    - Industrial Management
- Group IV—Life Sciences[†]
    - Bacteriology
    - Botany
    - Genetics
    - Zoology
- Group V—Physical Sciences[†]
    - Chemistry
    - Geology
    - Physics

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[*] At least two courses must be taken in each subject chosen.

[†] No course in the 100 series is acceptable toward the cluster minor and not more than two courses in the 200 series. At least two courses must be taken in each subject chosen.

APPROVED ELECTIVES FOR STUDENTS IN THE COLLEGE OF LIBERAL ARTS

Class advisers in the College of Liberal Arts will normally approve the following courses as electives, but the Dean of Liberal Arts retains the prerogative of limiting the total number of credits that may be approved in a discipline or area:

All courses offered in the College of Liberal Arts and the College of Physical and Mathematical Sciences except: Ch 450; Engl 111; Geol 406; Phys 460; Psych 211; Math 100, 115, 116, 215, 216;

All courses in Economics;
All courses in Accounting;
Architecture 253, 303, 304, 315, 316, 415, 416, 517-530, to a limit of 12 credits;
Biol 101;
Bot 102, 104, 202 (other courses by special arrangement);
Comp Sc 205, 311;
Education courses required for certification in South Carolina (other courses by special arrangement);
Ex St 301, 462;
In Ed 204, 440;
IM 201, 299, 307, 312, 313, 322, 405;
Mgt Sc 311, 413, 414;
RPA 304;
RS 301;
Courses in Visual Studies to a limit of 9 credits;
Zool 102, 104, 301, 302, 304, 460.

SCHOOL OF NURSING

The School of Nursing provides two programs designed to prepare undergraduate men and women students for a career in nursing.

The program leading to the Bachelor of Science in Nursing degree is designed to prepare nurses for the practice of professional nursing in a variety of settings—hospitals, industry, clinics, and public health agencies. The program offers the foundation for graduate study in nursing, and an unlimited opportunity for men and women for sound career development in professional nursing. The baccalaureate program is four academic years and one six-week summer term in length. The student is enrolled in liberal arts and basic science courses during the first two years. These courses are arranged sequentially in order to provide the foundation for professional courses which are planned for the junior and senior years. In addition advanced liberal arts courses are taken during the junior and senior years. Clinical nursing experiences under the guidance of the School of Nursing faculty will take place with patients in the Greenville Hospital Systems and with local public health agencies.

The program leading to the Associate in Arts degree is designed to prepare the graduate at the technical level of nursing for direct patient-centered nursing under supervision in hospitals and other institutional health centers. The associate degree program is two academic years, including one six-week summer session. The nursing major accounts for fifty percent of the total credit hours. This technical background is balanced by courses in the biologic and social sciences and the humanities. Clinical learning experiences planned as an integral part of the program, under the guidance of the School of Nursing faculty, take place with patients in the Anderson Memorial Hospital.

Students enrolled in the School of Nursing must meet the course requirements as described for each program in order to qualify for the degree and for licensure to practice Nursing.

BACHELOR OF SCIENCE IN NURSING CURRICULUM

Freshman Year

First Semester		*Second Semester*	
Biol 101 Prin. of Biology	3 (3,0)	Ch 102 General Chemistry	4 (3,3)
Ch 101 General Chemistry	4 (3,3)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Math 102 Math. Analysis	3 (3,0)
Math 101 Math. Analysis	3 (3,0)	Modern Language	3 (3,1)
Modern Language	3 (3,1)	Zool 102 Prin. of Zoology	2 (2,0)
Nurs 100 Orientation	1 (1,0)	Zool 104 Lab. Exer. in Zoology	1 (0,2)
	17		16

Sophomore Year

Ch 220 El. Org. Chem.	4 (3,3)	Ch 310 Elem. Bio-Chem.	4 (3,3)
Engl 204 Survey of Engl. and American Lit.	3 (3,0)	History (Elective)	3 (3,0)
Micro 305 Gen. Microbiology	4 (3,3)	Nurs 207 Dynamics of Human Relations	3 (2,3)
Psych 201 Gen. Psych.	3 (3,0)	Psych 211 Growth & Develop.	3 (3,0)
Zool 461 Anatomy	3 (3,0)	Soc 201 Introd. to Soc.	3 (3,0)
	17		16

SUMMER (First Session)

Nurs 208	Problem Solving in Nursing	3 (2,3)
Zool 460	Gen. Physiology	3 (2,3)
		6

JUNIOR YEAR

First Semester			*Second Semester*		
Math 203 Elem. Stat. Infer.	3	(3,0)	Nurs 310 Perspectives in Nursing Intervention	3	(3,0)
Nurs 309 Human Values in Nurs.	3	(3,0)	Nurs 312 Nurs. of Acute and Chronically Distressed	4	(1,9)
Nurs 311 Nurs. During Alterations in Life Patterns	4	(1,9)	Nurs 314 Nursing in the Home	3	(2,3)
Nurs 313 The Prom. of Health	3	(2,3)	Soc 311 The Family	3	(3,0)
Soc 202 Social Problems	3	(3,0)	Elective*	3	(3,0)
	16			16	

SENIOR YEAR

Nurs 415 Nurs. as a Social Force	3	(3,0)	Nurs 422 Cur. Research in Nurs.	3	(3,0)
Nurs 417 Intensive Nursing	4	(1,9)	Nurs 425 Independent Study in Nursing	7	(3,12)
Nurs 419 The Multiprob. Family	3	(2,3)	Psych 302 Social Psychology	3	(3,0)
Nurs 421 Hist. & Philoso. of Nurs.	3	(3,0)	Elective*	3	(3,0)
RS 301 Rural Sociology	3	(3,0)			
	16			16	

136 Total Semester Hours

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* Electives from the following: Humanities, Literature, Philosophy, Music.

Note: Nurs 207 and Nurs 208 open to students enrolled in baccalaureate degree program only. 1.80 grade-point ratio required for registration in Nursing courses 300 and above.

ASSOCIATE IN ARTS IN NURSING

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Nurs 100 Orientation	1	(1,0)	Nurs 102 Fundamentals of Nurs. II	6	(3,9)
Nurs 101 Fundamentals of Nurs. I	6	(3,9)	Nurs 106 Integrated Science II	4	(3,3)
Nurs 105 Integrated Science I	4	(3,3)	Psych 201 Gen. Psychology	3	(3,0)
Elective*	3				
	17			16	

SUMMER SESSION (6 WEEKS)

Nurs 104 Medical-Surgical Nursing I ... 5 (3,6)

Third Semester			*Fourth Semester*		
Nurs 202 Pediatric Nursing	5	(3,6)	Nurs 201 Psychodynamic Nursing	5	(3,6)
Nurs 206 Medical-Surg. Nurs. II	6	(3,9)	Nurs 204 Mat. and Newborn Care	5	(3,6)
Psych 211 Growth and Develop.	3	(3,0)	Psych 402 Abnormal Psychology	3	(3,0)
Soc 201 Introd. to Soc.	3	(3,0)	Soc 311 The Family	3	(3,0)
	17			16	

71 Total Semester Hours

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* Elective from the following: History, Humanities, Literature, Music, Philosophy, Political Science.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

The College of Physical and Mathematical Sciences, attuned to the times and its needs, offers six major curriculums leading to the degree of Bachelor of Science. These are Chemistry, Geology, Mathematics, Medical Technology, Physics, and Pre-medicine (Pre-dentistry).

In addition, a curriculum in Arts and Sciences, with a major emphasis in either Chemistry, Geology, Mathematics, or Physics can be pursued. The fulfillment of the requirements of this curriculum results in a Bachelor of Arts degree.

Not only are the departments in the College of Physical and Mathematical Sciences concerned with their own programs but they work closely with the other academic departments in the University. This interweaving of the physical and mathematical sciences with other disciplines, such as biology, economics, engineering, management, and others, allows a student greater flexibility and responsibility in designing his own program.

BACHELOR OF ARTS CURRICULUM

The curriculum leading to the Bachelor of Arts degree is designed to meet the needs of those students who desire a broad general education. The first two years are spent in introductory work in various areas in order to give the student breadth of view. This type of background enables the student to take a more intelligent part in the selection of his major and minor fields of concentration. The major areas in the College of Physical and Mathematical Sciences are Chemistry, Geology, Mathematics, and Physics.

There are a great number of choices in the minor area from the different academic departments in the University. Thus, a student has a larger degree of flexibility and responsibility in designing his curriculum in the Bachelor of Arts program. The minor fields are:

Biology
Chemistry
Economics
English
Fine Arts
Geology
History
Mathematics
Modern Languages
Political Science
Philosophy
Physics
Psychology
Sociology

Furthermore, a cluster minor may be taken. The cluster minor concentration should consist of 15 semester credits in courses numbered higher than 300 (with some exceptions). The subject area of the major should be excluded from the grouping in the minor. The groups available in the cluster minor are:

Group I—Social Sciences
Group II—Philosophy and Religion
Group III—Fine Arts
Group IV—Administration
Group V—Life Sciences

The major concentration requires 24 semester hours and the minor 15 semester hours above the sophomore level unless otherwise indicated. These fit in the basic curriculum for the three upperclass years with minor variations depending on the specific major or minor selected. Consequently, a student not positive of his major or minor field has the advantage of making his decision while in the curriculum with a minimum loss of credit.

MAJOR FIELDS OF CONCENTRATION

CHEMISTRY

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

Sophomore Year

Ch 223 Organic Chemistry*	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 228 Organic Chem. Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Hist 171 Western Civilization	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(3,0)	or Hist 172 Western Civilization	3	(3,0)
Modern Language	3	(3,1)	Phys 221 Thermal & Elec. Phen.	3	(3,0)
AS or MS or Elective	1		Modern Language	3	(3,0)
	18		AS or MS or Elective	1	
				17	

Junior Year

Hist 172 Western Civilization	3	(3,0)	Chemistry Major	4	
or Hist 173 Western Civilization	3	(3,0)	Minor	6	
Chemistry Major	4		Elective	8	
Minor	3			18	
Elective	7				
	17				

Senior Year

Chemistry Major	4	Chemistry Major	4
Minor	3	Minor	3
Elective	8	Elective	8
	15		15
		130 Total Semester Hours	

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* The organic chemistry will count toward the 24 hours of the chemistry major.

GEOLOGY

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

Sophomore Year

First Semester			*Second Semester*		
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Survey of Engl. and American Lit.	3	(3,0)
Geol 201 Physical Geology	4	(3,3)	Geol 202 Historical Geology	4	(3,3)
Math 206 Cal. of Sev. Var.	4	(5,0)	Modern Language	3	(3,0)
Modern Language	3	(3,1)	Approved Electives	6	
AS or MS or Elective	1		AS or MS or Elective	1	
	15			17	

Junior Year

Humanities	3		Geol 309 Petrology	3	(2,3)
Geol 306 Mineralogy	3	(2,3)	Humanities	3	
Major	3		Major	3	
Minor	3		Minor	3	
Approved Elective	3		Approved Elective	3	
	15			15	

Senior Year

Geol 402 Structural Geology	3	(2,2)	Geol 404 Economic Geology	3	(3,0)
Major	3		Major	3	
Minor	6		Minor	3	
Social Sciences	3		Social Sciences	3	
			Approved Elective	3	
	15			15	

128 Total Semester Hours

MATHEMATICS

For a major concentration a recommended program of study is shown below, with 127 semester hours required for graduation.

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Natural Science	4		Natural Science	4	
AS or MS or Elective*	1		AS or MS or Elective*	1	
	18			18	

Sophomore Year

Comp Sc 205 Elem. Comp. Prog.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 295 Foundations of Analysis†	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Elective	3		AS or MS or Elective*	1	
AS or MS or Elective*	1			14	
	17				

Junior Year

Math 301 Stat. Theory & Meth. I	3	(3,0)	Econ 201 Principles of Econ.	3	(3,0)
Math 411 Linear Algebra	3	(3,0)	Math Elective	3	
Humanities	3		Mus 210 Music Appreciation	3	(3,0)
Minor	3		or Arch 303 Evol. of Vis. Arts	3	(3,0)
Elective	3		Minor	3	
			Elective	3	
	15			15	

Senior Year

Math 412 Introd. to Mod. Alg.	3	(3,0)	Math 464 Math. Anal. II	3	(3,0)
or Math 419 App. Comb. Alg.	3	(3,0)	or Math 454 Adv. Cal. II	3	(3,0)
Math 463 Math. Anal. I	3	(3,0)	Math Elective	3	
or Math 453 Adv. Cal. I	3	(3,0)	Minor	3	
Minor	6		Social Sciences	3	
Social Sciences	3		Elective	3	
	15			15	

127 Total Semester Hours

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* Those electing not to take ROTC should take a four-hour elective during the second semester sophomore year.

† The Foundations of Analysis will count toward the 24 hours of the Mathematics major.

PHYSICS

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,1)
Phys 101 Current Phys	1	(0,2)	Phys 132 Gen. Phys. I	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

Sophomore Year

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 231 Gen. Phys. II	3	(3,0)	Phys 232 Gen. Phys. III	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

Junior Year

Phys 321 Mechanics I	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Humanities	3		Phys 340 Elect. & Mag.	3	(3,0)
Minor	3		Humanities	3	
Electives	5		Minor	3	
	14		Elective	2	
				14	

Senior Year

Phys 455 Quantum Phys. I	3	(3,0)	Phys. Elective	4	
Phys. Elective	4		Minor	3	
Minor	6		Social Science	3	
Social Science	3		Elective	4	
	16			14	
			128 Total Semester Hours		

For a major or minor concentration in Physics, Phys 221 and 222 will count.

MINOR CONCENTRATIONS

Biology. The recommended programs of study consists of 15 semester hours from the field of biological sciences in addition to Biol 101, Bot 102, 104, and Zool 102, 104.

Economics. The recommended program of study consists of Econ 201, 202 and 15 semester hours selected from the following (including 314 and 407): Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

English. The recommended program of study includes the required courses of the Bachelor of Arts curriculum and 15 semester hours of English, arranged as follows:

Group I—Six semester credits from these courses: Engl 405 and either 422 or 423.

Group II—Three semester credits from these courses: Engl 402, 404, 425, 427, 429, 431, 437, 443, 445, 446, 461, 462.

Group III—Six additional semester credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts consists of Hum 201-202 or Arch 101-102 and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected:

Arch 303, 315, 316, 415, 416, all 500 courses;
Engl 305, 308, 310, 311, 331, 332, 333;
Hum 203;
Mus 151, 152, 205, 206, 210, 315, 316, 362, 365, 411;
Phil 305;
Visual Studies (all courses).

History. The recommended program of study consists of 15 semester hours with a minimum of three hours from each of the following groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300, including at least one course on the 400 level.

Philosophy. The recommended program of study consists of 15 semester hours of course work beyond Phil 201, 302—drawn from Phil 211, 303, 304, 305, 309, 312, 318, 322, 344, 422, 425.

Political Science. The recommended program of study consists of 15 semester hours beyond Pol Sc 101 (or 202 or 301) and 201 in courses drawn from at least three of the following fields:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433
4. Political Behavior—Pol Sc 341, 442, 433
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372, 473

Psychology. The recommended program of study consists of required courses Psych 201, 202 and 15 semester hours to be selected from Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 498, Comp Sc 205.

Sociology. A minor consists of 15 semester hours beyond Soc 201, 202 to be selected from Pol Sc 341, Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499, RS 359.

CLUSTER MINORS

Group I—Social Sciences

No fewer than two courses in each subject chosen:

- Economics
- History
- Political Science
- Psychology
- Sociology

Group II—Philosophy and Religion

Group III—Fine Arts

Of these courses, 9 semester credits must be taken in courses numbered 300 or higher:

- Architecture 303, 315, 316, 415, 416, 517-524, 529, 530;
- English 305, 308, 310, 311, 331, 332, 333;
- Music 151, 152, 205, 206, 210, 315, 316, 362, 365, 411;
- Philosophy 305;
- Visual Arts 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416.

Group IV—Administration

No fewer than two courses in each subject chosen:

- Economics
- Accounting
- Industrial Management

Group V—Life Sciences

No course in the 100 series is applicable and not more than two courses in the 200 series. No fewer than two courses in each subject chosen:

- Bacteriology
- Botany
- Genetics
- Zoology

Group VI—Physical Sciences

No course in the 100 series is applicable and not more than two courses in each subject chosen:

- Chemistry
- Geology
- Mathematics
- Physics

BACHELOR OF SCIENCE CURRICULUMS

CHEMISTRY

Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to the student whose education is built around the principles of this discipline.

The curriculum in chemistry provides, through its advanced chemistry courses and large number of elective hours, a program that may be suited to a student's specific needs, whether he be interested in graduate work; industrial chemistry, sales or supervision; or related professional fields. [Significant features of the program are the student's extensive participation in experimental laboratory work and his association with teachers who also pursue research activities. Because the undergraduate and graduate studies are closely connected, an undergraduate may elect to take part in a research investigation during his junior and senior years.]

CHEMISTRY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 172 Western Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
or Hist 173 Western Civilization	3	(3,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective*	1 — 3	
AS or MS or Elective*	1 — 3			15 — 17	
	15 — 17				

Sophomore Year

Ch 223 Org. Chem.	3	(3,0)	Ch 224 Org. Chem.	3	(3,0)
Ch 225 Org. Chem. Lab.	2	(0,6)	Ch 226 Org. Chem. Lab.	2	(0,6)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
AS or MS (Elective)	1		AS or MS (Elective)	1	
	17 — 16			17 — 16	

JUNIOR YEAR

First Semester			*Second Semester*		
Ch 313 Quan. Analysis	3	(3,0)	Ch 332 Phys. Chemistry	3	(3,0)
Ch 315 Quan. Anal. Lab.	2	(0,6)	Ch 340 Phys. Chem. Lab.	1	(0,3)
Ch 331 Phys. Chemistry	3	(3,0)	Ch 411 Instr. Analysis	4	(2,6)
Ch 339 Phys. Chemistry Lab.	1	(0,3)	Ch 442 Chem. Lit.	1	(1,0)
Ger 101 Elem. German	3	(3,1)	Ger 102 Elem. German	3	(3,1)
Elective*	6		Elective*	5 — 3	
	18			17 — 15	

SENIOR YEAR

Ch 402 Inorg. Chem.	3	(3,0)	Electives*	15
Ch 435 Atom. & Mol. Struct.	3	(3,0)		
Ch 436 Phys. Chem. Lab.	1	(0,3)		15
Electives*	9			
	16			

130 Total Semester Hours

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* Electives:
For the degree of B.S. in Chemistry, a student must elect at least 18 hours in English, Languages, History, Political Science, Economics, Sociology, Psychology, etc. At least one advanced lecture course (400 level) in chemistry and one advanced laboratory must be elected.

GEOLOGY

Geology is a relatively young science. The word itself is only about 200 years old. It means the science of the earth. Such a science must be involved with the physics and chemistry of materials which comprise the earth, but equally important it must consider the development of life on earth. Fundamentally, then, the chemical, physical, and biological responses to various environments on and in the earth must be thoroughly understood so that the historical development of the earth may be deduced, predictions of the future inferred, and natural resources intelligently developed.

Industry in our modern civilization is dependent on minerals and rocks. Metals have their origin in them as do our chief power sources, coal, petroleum, and radioactive minerals. The power and wealth of nations depend largely on their exploration, control and development of mineral wealth.

Geologists today are entering upon a new era. Widening horizons are indicated by employment not only in mineral producing industries but by railroads, municipalities, engineering firms, and water authorities. For this reason, it is important that the geologists' education rest on a broad yet rigorous base.

This curriculum provides the student with the fundamentals in the geological sciences and excellent support in the other basic sciences. On successful completion of the Bachelor of Science program the student should be adequately prepared for employment or for graduate study in any field of geology.

GEOLOGY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language[*]	3	(3,1)	Modern Language	3	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Geol 201 Physical Geology	4	(3,3)	Geol 202 Historical Geology	4	(3,3)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
Modern Language	3	(3,1)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			17	

JUNIOR YEAR

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Geol 306 Mineralogy	3	(2,3)	and Bot 104 Lab. Exer. in Bot.	1	(0,2)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
Electives[†]	5		Ex St 301 Introd. Statistics	3	(2,2)
			Geol 309 Petrology	3	(2,3)
	15		Geol 313 Strat. and Sed.	3	(3,0)
			Phys 222 Optics & Mod. Phys.	3	(3,0)
			Phys 224 Modern Phys. Lab.	1	(0,3)
				16	

Summer Geology Field Camp,[‡] 6 semester hours

SENIOR YEAR

Geol 402 Structural Geology	3	(2,2)	Geol 310 Optical Mineralogy	3	(2,2)
Geol 403 Invert. Paleontology	3	(2,3)	Geol 404 Economic Geology	3	(3,0)
Approved Electives[†]	9		Approved Electives[†]	11	
	15			17	

134 Total Semester Hours

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[*] German or French is recommended. Two years in the same language is required.

[†] At least 12 hours must be elected from the humanities and/or social sciences.

[‡] Clemson University does not conduct a field camp in geology, but attendance at a camp approved by the geology staff is required.

MATHEMATICS

The mathematics curriculum is designed to give basic training to those students whose ultimate goal is the creation of mathematical concepts and methods that are of basic and general applicability to the desired subject whether it be physics, computer science, communication theory, data processing, statistics, operations research, economics, or any branch of the physical sciences in which a strong mathematical background is a prerequisite. In addition to containing basic mathematics courses which are needed to prepare the student for the present day mathematical world, the curriculum allows the student in his junior year to select one of seven optional sets of courses which will provide an introduction to an area where mathematics is applied. These options are physics, operations research, computer science, managerial science, communications, chemistry, and statistics.

This curriculum provides an adequate background for the student who plans to pursue graduate study in mathematics and at the same time adequately prepares the student to fill many interesting positions in space research, computer development, business, or government research.

MATHEMATICS CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Fr 101 Elem. French	3	(3,1)	Fr 102 Elem. French	3	(3,1)
or Ger 101 Elem. German	3	(3,1)	or Ger 102 Elem. German	3	(3,1)
Hist 172 Western Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
or Hist 173 Western Civilization	3	(3,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective†	1	
AS or MS or Elective†	1				
	18			18	

SOPHOMORE YEAR

Comp Sc 205 Elem. Comp. Prog.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 295 Foundations of Analysis	3	(3,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Elective*	3		Elective*	3	
AS or MS or Elective†	1		AS or MS or Elective†	1	
	18			18	

JUNIOR YEAR

Econ 201 Principles of Econ.	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Math 301 Stat. Th. & Methods I	3	(3,0)	Math 411 Linear Algebra	3	(3,0)
Math 453 Adv. Calculus I	3	(3,0)	Math 454 Adv. Calculus II	3	(3,0)
or Math 463 Math. Anal. I*	3	(3,0)	or Math 464 Math. Anal. II*	3	(3,0)
Option	3		Option	3	
Elective‡	3		Elective‡	3	
	15			15	

SENIOR YEAR

Math 402 Th. of Probability	3	(3,0)	Math 403 Stat. Inference	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)	or Math 404 Introd. to Stoch. Proc.	3	(3,0)
or Math 419 App. Comb. Alg.	3	(3,0)	or Math 405 Stat. Th. & Methods II	3	(3,0)
Option	3		Math Elective*	3	
Elective‡	4		Option	3	
	13		Elective‡	4	
				13	

128 Total Semester Hours

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* Those who expect to go to graduate school should take a second year of the language of his choice; should take Math 463, 464 instead of Math 453, 454; should take Math 413 or 415 or 424 for this elective.

‡ The electives may be taken from those courses which the catalog lists as approved courses in the College of Physical and Mathematical Sciences or the College of Liberal Arts or in other academic departments.

† Those electing not to take ROTC should take six hours of electives during each semester of the senior year.

The Options are:

A. CHEMISTRY

Ch 331 Physical Chemistry	3	(3,0)
Ch 332 Physical Chemistry	3	(3,0)
Ch 339 Physical Chem. Lab.	1	(0,3)
Ch 340 Physical Chem. Lab.	1	(0,3)
Ch 402 Inorganic Chemistry	3	(3,0)
Ch 435 Atomic & Molec. Structure	3	(3,0)
Ch 436 Physical Chem. Lab.	1	(0,3)
	15	

B. COMMUNICATIONS

EE 320 Electronics I	2	(2,0)
EE 321 Electronics II	2	(2,0)
EE 325 Elec. & Electromag. Lab.	1	(0,2)
EE 326 Elec. & Electromag. Lab.	1	(0,2)
EE 330 Systems I	2	(2,0)
EE 331 Elec. Circuits Workshop I	2	(0,4)
EE 332 Systems II	2	(2,0)
EE 333 Elec. Cir. Workshop II	2	(0,4)
	14	

C. COMPUTER SCIENCE

Comp Sc 311 Comp. Org. & Prog.	3	(3,0)
Comp Sc 409 Introd. to Num. Anal. I	3	(3,0)
Comp Sc 410 Introd. to Num. Anal. II	3	(3,0)
Comp Sc 428 Algo. Lang. & Comp.	3	(3,0)
Math 452 Linear Programming	3	(3,0)
	15	

D. MANAGERIAL SCIENCE

Econ 202 Principles of Econ.	3	(3,0)
Econ 314 Inter. Econ. Th.	3	(3,0)
Mgt Sc 311 Introd. to Econometrics	3	(3,0)
or IM 404 Managerial Econ.	3	(3,0)
Math 452 Linear Programming	3	(3,0)
Math 473 Introd. to Nonlin. Opt.	3	(3,0)
	15	

E. OPERATIONS RESEARCH

IM 402 Oper. Plan. & Control	3	(3,0)
Math 404 Introd. to Stoch. Proc.	3	(3,0)
Math 429 Num. Anal. I	3	(3,0)
Math 452 Linear Programming	3	(3,0)
Math 473 Introd. to Nonlin. Opt.	3	(3,0)
	15	

F. PHYSICS

Phys 321 Mechanics I	3	(3,0)
Phys 322 Mechanics II	3	(3,0)
or Phys 404 Astrodynamics	3	(3,0)
or Phys 441 Elec. & Magnetism	3	(3,0)
Phys 340 Elec. & Magnetism	3	(3,0)
	9	

G. STATISTICS

Math 404 Introd. to Stoch Proc.	3	(3,0)
Math 405 Stat. Th. and Methods II	3	(3,0)
Math 409 Stat. Th. and Methods III	3	(3,0)
Math 471 Appl. Stat. Decision Theory	3	(3,0)
	12	

MEDICAL TECHNOLOGY

Medical Technologists are qualified to perform a wide variety of chemical, microscopical, and bacteriological tests to aid physicians in the detection, diagnosis, and treatment of disease. Some medical technologists are responsible to a medical doctor, generally a pathologist, while others work under the supervision of a medical scientist who specializes in a particular branch of clinical science. The largest group of medical technologists work in hospital laboratories.

In cooperation with the Anderson Memorial Hospital, the Greenville General Hospital, and Self Memorial Hospital in Greenwood, Clemson offers a four-year curriculum leading to the Bachelor of Science in Medical Technology. The student spends the first three years of this program in class work at Clemson and the fourth year at one of the participating hospitals, according to the student's choice and previous agreement with the hospital. While in residence in Anderson, Greenville, or Greenwood, the student will take specified courses under instructors on the hospital staff. During the fourth year of work, both room and board are furnished by the hospital.

Upon satisfactory completion of the prescribed courses, the student will be awarded the Bachelor of Science degree in Medical Technology.

MEDICAL TECHNOLOGY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Biol 101 Prin. of Biology	3	(3,0)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Hist 101 American History	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 101 Mathematical Analysis	3	(3,0)	Math 102 Mathematical Analysis	3	(3,0)
Modern Language	3	(3,1)	Med Tech 101 Introd. to M. Tech.	1	(1,0)
AS or MS or Elective	1		Modern Language	3	(3,1)
			AS or MS or Elective	1	
	17			18	

Sophomore Year

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hist 102 American History	3	(3,0)	Phys 207 Gen. Physics	4	(3,2)
Zool 202 Vert. Zoology	4	(3,3)	Electives	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

Junior Year

Ch 313 Quan. Analysis	3	(3,0)	Gen 302 Genetics	4	(3,3)
Ch 317 Quan. Anal. Lab.	1	(0,3)	Hist 172 Western Civilization	3	(3,0)
or Ch 310 Elem. Biochemistry	4	(3,3)	or Hist 173 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Micro 305 Gen. Microbiology	4	(3,3)
or Hist 172 Western Civilization	3	(3,0)	Psych 201 Gen. Psychology	3	(3,0)
Phys 208 Gen. Physics	4	(3,2)	Electives	3	
Zool 307 An. Anat. & Physio.	3	(2,3)			
Electives	2			17	
	16				

Senior Year
(52 Weeks)

Med Tech 401	Serology and Immunology	4	(21,10, 49)[*]
Med Tech 402	Microbiology	7	(56, 6,470)
Med Tech 403	Hematology	5	(12,32,276)
Med Tech 404	Blood Bank	3	(8,20,132)
Med Tech 405	Cytology	1	(2,12, 26)
Med Tech 406	Histology	3	(20,30,190)
Med Tech 407	Urinalysis	2	(10, 8,102)
Med Tech 408	Chemistry	10	(40,50,470)
Med Tech 409	Radioisotopes	1	(2, 0, 7)
		36	

140 Total Semester Hours

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[*] First figure represents lecture hours, second figure represents seminar hours, and third figure represents clinical practice hours.

PHYSICS

Physics is the fundamental science. The word physics comes from the Greek term meaning nature. Therefore, physics is a science dedicated to the study of all natural phenomena. Physics is the foundation for the other experimental sciences. The physics curriculum is designed with this point of view.

The first two years of the physics curriculum is generally the same as that for mathematics, the other physical sciences and engineering. During the junior and senior years the physics student is given a strong background in the basic physics courses at an advanced level and is allowed to specialize in a variety of other fields by selecting one of eight options. The options are astrophysics, biophysics, chemical physics, computer science, electronics, geophysics, mathematical physics, and physics. After completing one of these curriculums the student is prepared for positions in industry (*e. g.*, aircraft, electronics, petroleum, textiles, pharmaceutical) and government laboratories (*e. g.*, space research). Those students who select the physics or mathematical physics options are well equipped for graduate study in physics.

PHYSICS CURRICULUM WITH OPTIONS IN THE PHYSICAL AND MATHEMATICAL SCIENCES

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Fr 101 Elem. French	3	(3,1)	Fr 102 Elem. French	3	(3,1)
or Ger 101 Elem. German*	3	(3,1)	or Ger 102 Elem. German*	3	(3,1)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Phys 101 Current Phys.	1	(0,2)	Phys 132 Gen. Physics	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I‡	4	(5,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 231 Gen. Physics II	3	(3,0)	Phys 232 Gen. Physics III	3	(3,0)
Approved Elective†	4		Approved Elective†	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Hist 172 Western Civilization	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
or Hist 173 Western Civilization	3	(3,0)	Phys 326 Exp. Physics II	4	(2,6)
Math 309 Engr. Math II‡	3	(3,0)	Phys 340 Elect. & Magnetism	3	(3,0)
Phys 321 Mechanics I	3	(3,0)	Approved Elective†	3	
Phys 325 Exp. Physics I	4	(2,6)	Option§	3	
Option§	3			16	
	16				

SENIOR YEAR

Phys 441 Elect. & Magnetism	3	(3,0)	Physics (as approved)	3	(3,0)
Phys 455 Quantum Physics I	3	(3,0)	Option§	3	
Phys 465 Thermo. & Stat. Mech.	3	(3,0)	Approved Elective†	9	
Approved Elective†	3			15	
Option§	3				
	15		128 Total Semester Hours		

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* Russ 101, 102 may be substituted.

† A minimum of 12 hours of electives must be chosen from course offerings in the Humanities and Social Sciences.

‡ Math 411 may be taken in lieu of Math 309.

§ The OPTIONS are:

A. ASTROPHYSICS

Phys 304 Descriptive Astronomy	3	(3,0)
Phys 404 Astrodynamics	3	(3,0)
Phys 432 Physical Optics	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
	12	

B. CHEMICAL PHYSICS

Ch 331 Physical Chem.	3	(3,0)
Ch 332 Physical Chem.	3	(3,0)
Ch 435 Atomic & Molec. Struct.	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
or Ch 402 Inorganic Chem.	3	(3,0)
	12	

C. COMPUTER SCIENCE

Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Comp Sc 311 Com. Organ. & Pro.	3	(3,0)
Comp Sc 409 Numerical Anal.	3	(3,0)
Comp Sc 428 Algorith. Lang. & Compilers	3	(3,0)
or Phys 446 Solid St. Phys.	3	(3,0)
or Math 429 Introd. Num. Anal.	3	(3,0)
	12	

D. ELECTRONICS

EE 320 Electronics I	2	(2,0)
EE 325 Electronics Lab. I	1	(0,2)
EE 330 Systems I	2	(2,0)
EE 331 Elec. Workshop I	2	(0,4)
EE 332 Systems II	2	(2,0)
EE 333 Elec. Workshop II	2	(0,4)
	11	

E. GEOPHYSICS

Geol 201 Physical Geo.	4	(3,3)
Geol 306 Mineralogy	3	(2,3)
Any two of Geol 309	3	(2,3)
Geol 402	3	(2,2)
Phys 446	3	(3,0)
	13	

F. MATHEMATICAL PHYSICS

Math 453 Advanced Cal. I	3	(3,0)
Math 454 Advanced Cal. II	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
Math (as approved)	3	(3,0)
	12	

G. PHYSICS

Phys 446	Solid St. Phys.	3	(3,0)
Phys 456	Quantum Physics II	3	(3,0)
Math	(as approved)	6	
		12	

PHYSICS CURRICULUM WITH BIOPHYSICS OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Fr 101 Elem. French	3	(3,1)	Fr 102 Elem. French	3	(3,1)
or Ger 101 Elem. German*	3	(3,1)	or Ger 102 Elem. German*	3	(3,1)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. & Lin. Alg.	4	(5,0)
Phys 101 Current Phys.	1	(0,2)	Phys 132 Gen. Physics I	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Biol 101 Prin. of Biol.	3	(3,0)	Bot 102 Prin. of Bot.	2	(2,0)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Bot 104 Lab. Exer. in Bot.	1	(0,2)
Hist 172 Western Civilization	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
or Hist 173 Western Civilization	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 224 Mod. Physics Lab.	1	(0,3)
Phys 223 Electron Physics Lab.	1	(0,3)	Phys 232 Gen. Physics III	3	(3,0)
Phys 231 Gen. Physics II	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1			15	
	18				

JUNIOR YEAR

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Phys 321 Mechanics I	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Phys 325 Exp. Physics I	4	(2,6)	Phys 326 Exp. Physics II	4	(2,6)
Zool 102 Prin. of Zool.	2	(2,0)	Phys 340 Elect. & Magnetism	3	(3,0)
Zool 104 Lab. Exer. in Zool.	1	(0,2)		14	
Approved Elective†	3				
	17				

SENIOR YEAR

Ch 423 BioChem.	3	(3,0)	Ch 424 BioChem.	3	(3,0)
Ch 425 BioChem. Lab.	1	(0,3)	Ch 426 BioChem. Lab.	1	(0,3)
Phys 455 Quantum Physics I	3	(3,0)	Physics (as approved)	3	(3,0)
Phys 465 Thermo. & Stat. Mech.	3	(3,0)	Approved Elective†	8	
Approved Elective†	5			15	
	15				

128 Total Semester Hours

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* Russ 101, 102 may be substituted.

† A minimum of 12 hours of electives must be chosen from course offerings in the Humanities and Social Sciences.

PRE-MEDICINE AND PRE-DENTISTRY

Medicine and dentistry need individuals with a diversity of educational backgrounds and a wide variety of talents and interests. The philosophies of education, specific premedical and predental courses requirements, other qualifications for enrollment, and systems of training vary among the medical and dental schools, but all recognize the desirability of a broad education—a good foundation in the natural sciences (mathematics, chemistry, biology, and physics), highly developed communication skills, and a solid background in the social sciences and humanities. The absolute requirements for medical and dental school admission (16 credit hours in chemistry, 8 credit hours in biology, 8 credit hours in physics, 6 credit hours in English, and 6 credit hours in mathematics) are purposely limited in order to allow latitude for developing individualized undergraduate programs of study.

The student preparing for a career in medicine or dentistry can major in the behavioral or natural sciences, and many do major in one of the sciences; however, this is not necessary. The Association of American Medical Colleges and the American Association of Dental Schools recommend that the premedical and predental student should feel free to develop his major area of interest, realizing that the medical and dental school is more interested in the quality and scope of the work accomplished than in the time spent or the major field chosen. It is possible to major in a nonscience area, carrying the necessary science courses as electives; however, since so much of medicine and dentistry is derived from a scientific basis, the student who majors in a nonscientific field and elects the minimum number of required science courses must excel in them to insure the adequacy of his preparation.

A suggested curriculum in Pre-medicine and Pre-dentistry, offered here, is designed to meet the general entrance requirements of most medical and dental schools and, as well, to provide a broad education in the natural sciences, the social sciences, the humanities, and communication skills.

Those preparing for the study of medicine are advised to complete four years of undergraduate work before entering a medical school, although some medical schools will admit an exceptional student after three years of preparation. Many dental schools will accept the better student after three years of preparation.

PRE-MEDICINE AND PRE-DENTISTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Ch 101 General Chemistry	4	(3,3)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Math 108 Cal. & Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Zool 202 Vert. Zoology	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

SOPHOMORE YEAR

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Hum 201 Introd. to Humanities	3	(3,0)	Hum 202 Introd. to Humanities	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(3,0)	Phys 221 Therm. & Elec. Phen.	3	(3,0)
Soc 201 Introd. to Sociology	3	(3,0)	Phys 223 Electron Phys. Lab.	1	(0,3)
AS or MS or Elective	1		Soc 202 Social Problems	3	(3,0)
	17		AS or MS or Elective	1	
				18	

JUNIOR YEAR

Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Gen 302 Genetics	4	(3,3)	Engl 217 Vocabulary Bldg.	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
Zool 301 Comp. Vert. Anat.	3	(2,3)	Zool 302 Vert. Embryology	3	(2,3)
Electives	4		Electives	4	
	17			16	

SENIOR YEAR

Engl 301 Public Speaking	3	(3,0)	Soc 381 Society & Socialization	3	(3,0)
Psych 201 Gen. Psychology	3	(3,0)	Electives	12	
Electives	10			15	
	16				

130 Total Semester Hours

PRE-PHARMACY

Pharmacy is a five-year program, the first two years of which can be taken at Clemson. The student who does pre-pharmacy here will transfer, as a rule, to the School of Pharmacy of the Medical University of South Carolina, where the final three years will be completed and by which institution the degree in Pharmacy will be awarded.

PRE-PHARMACY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Ch 101 General Chemistry	4	(3,3)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 Western Civilization	3	(3,0)
Hist 171 Western Civilization	3	(3,0)	or Hist 173 Western Civilization	3	(3,0)
or Hist 172 Western Civilization	3	(3,0)	Math 102 Math Analysis II	3	(3,0)
Math 101 Math Analysis I	3	(3,0)	Zool 202 Vert. Zoology	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

Sophomore Year

First Semester			*Second Semester*		
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Engl 203 Survey of Engl. Lit.	3	(3,0)	Engl 204 Surv. of Engl. & Amer. Lit.	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Soc 201 Introd. to Sociology	3	(3,0)	Soc 202 Social Problems	3	(3,0)
AS or MS or Elective	1		Electives	3	
			AS or MS or Elective	1	
	15			18	

68 Total Semester Hours

Approved Electives for Students in the College of Physical and Mathematical Sciences

Class advisers in the College of Physical and Mathematical Sciences will normally approve the following courses as electives, but the Dean of Physical and Mathematical Sciences retains the prerogative of limiting the total number of credits that may be approved in a discipline or area:

All courses offered in the College of Liberal Arts and the College of Physical and Mathematical Sciences except Ch 450, Engl 111, 351, Geol 406, Math 102, 103, 104, 115, 116, 215, 216, Psych 211.

Certain upper level courses, not given in the College of Physical and Mathematical Sciences listed below, plus others recommended in a particular curriculum:

Acct 201, 202, 305; Ag Ec 352, 357, 456; Arch 303, 315, 316, 415, 416, 517-524, 529, 530; BioE 301 401; Biol 101; Bot 102, 104, 352, 356, 404, 451; Econ 201, 202, 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 422; Ed 301, 302, 335, 405, 406; EE 315, 320, 321, 325, 326, 330, 331, 332, 333; Ent 301, 405, 410, 455; Ex St 462; Gen 302; IM 307, 312, 313, 322, 404, 415; ME 481, 484, 486; H Adm 308; Mgt Sc 311; Micro 305, 401; Vis 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416; Zool 102, 104, 301, 302, 307, 403, 404, 405.

In exceptional cases certain other courses, but not in excess of 6 semester hours for the Bachelor of Arts program and 9 semester hours for the Bachelor of Science program, may be approved by the class adviser and the Dean of the College of Physical and Mathematical Sciences.

DESCRIPTION OF COURSES

This list of courses includes for each course the catalog number, title of course, credit in semester hours, class laboratory hours per week, and the description of the course. In general, courses numbered 100-199 are freshman courses; 200-299, sophomore courses; 300-399, junior courses; and 400-499, senior courses. Courses numbered 600 or above are graduate courses and are open only to students admitted to the Graduate School, except that seniors with exceptional records may be enrolled with special permission. Where courses are offered on a schedule, there is a designation F, S, or SS following the title of each course, indicating whether it is customarily offered in the fall, spring, or summer school.

ACCOUNTING

Professor: C. C. Davis

Associate Professors: F. R. Gray, J. M. Wannamaker

Assistant Professors: R. W. Barron, J. A. Turner

Instructor: B. M. White

Acct 201—Principles of Accounting—3 cr. (3 and 0)
Practice in handling real and nominal accounts, together with an introduction to the use of various types of books of original entry, statements of profit and loss, and balance sheets.

Acct 202—Principles of Accounting—3 cr. (3 and 0)
Continuation of Acct 201 with special attention to corporation and partnership accounting with emphasis on adjustment procedures and the analysis of financial statements. *Prerequisite:* Acct 201.

Acct 301—Intermediate Accounting—3 cr. (3 and 0)
A course in the theory of accountancy designed to follow introductory theory presented in the basic principles courses. Intermediate accounting seeks to broaden the student's knowledge of financial accounting theory and practice. *Prerequisite:* Acct 201 and 202.

Acct 302—Intermediate Accounting—3 cr. (3 and 0)
A continuation of Accounting 301 with emphasis on managerial accounting. *Prerequisite:* Acct 201 and 202.

Acct 303—Cost Accounting—3 cr. (3 and 0)
The application of cost analysis to manufacturing and distributing problems. Analysis of the behavior characteristics of business costs and a study of principles involved in standard cost systems. Lectures and problems. *Prerequisite:* Acct 201 and 202.

Acct 305—Income Taxation—3 cr. (3 and 0)
Interpretation of Federal Income Tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Prerequisite:* Junior standing.

Acct 403—Accounting Research—2 cr. (2 and 0)
A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

Acct 405—Advanced Federal Taxes—3 cr. (3 and 0)
Tax planning and research. Advanced phases of income taxation with emphasis on special problems applicable to corporations, partnerships, estates and trusts. *Prerequisite:* Acct 305.

Acct 407—Accounting Research—1 cr. (1 and 0)
A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

Acct 410—Budgeting and Executive Control—3 cr. (3 and 0)
The study and application of selected techniques used in the planning and control functions of business organizations. *Prerequisite:* Acct 303.

Acct 411—Advanced Accounting—3 cr. (3 and 0)
A study of accounting principles and practices emphasizing parent-subsidiary accounting. *Prerequisite:* Acct 301, 302.

Acct 415—Auditing—3 cr. (3 and 0)
Professional and practical auditing theory. Review of internal controls, audit procedures, and development of audit programs for various types of businesses; consideration of auditor's professional and ethical standards. *Prerequisite:* Acct 301, 302.

Acct 420—CPA Review—3 cr. (3 and 0)
Intensive practice in analyzing and solving CPA level accounting problems. *Prerequisite:* Acct 411.

Acct 605—Advanced Federal Taxes—3 cr. (3 and 0)

Acct 610—Budgeting and Executive Control—3 cr. (3 and 0)

Acct 611—Advanced Accounting—3 cr. (3 and 0)

Acct 615—Auditing—3 cr. (3 and 0)

AEROSPACE STUDIES

Professor: Colonel E. N. Tyndall, *Head*

Assistant Professors: Maj. A. C. Brock, Maj. M. R. Koldyke, Jr., Capt. J. M. Etheredge, Capt. J. W. Giles, Capt. H. R. Hubbard, Capt. R. M. Peavler

GENERAL MILITARY EDUCATION PROGRAM

AS 109—World Military Systems—1 cr. (1 and 1)
An introduction to factors of national power, principles and nature of war; legislation, organization and function of the Department of Defense; history, missions, and organization of the United States Air Force. Corps Training includes drill fundamentals, customs and courtesies of the service.

AS 110—World Military Systems—1 cr. (1 and 1)
Surveys the history and development of U. S. strategic offensive and defensive forces including their missions, functions and organization; conventional nuclear weaponry, civil defense, aircraft and missile defense, concepts of

present and projections of future strategic defense requirements. Corps Training includes drill and ceremonies and Air Force career opportunities.

AS 209—World Military Systems—1 cr. (1 and 1)

A continuation of the study of world military forces placing special emphasis on the General Purposes forces of the Air Force, Army and Navy and their role throughout the entire spectrum of warfare. Also included are the roles of the aerospace support forces which enable the combat forces to carry out their primary missions. Corps Training.

AS 210—World Military Systems—1 cr. (1 and 1)

A study of the trends and implications in international affairs highlighting the struggle, the search and the prospects for peace. Special emphasis is given the conflict between democracy and communism, the alliances and collective security agreements of the United States to preserve peace and some of the specific problems and solutions involved in the search for peace. Corps Training.

PROFESSIONAL OFFICER EDUCATION PROGRAM

AS 309—Growth and Development of Aerospace Power—3 cr. (3 and 1)

A comprehensive study of the development of Aerospace Power and the USAF, its doctrine, mission and organization. Course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training emphasizes leadership development and Air Force career opportunities.

AS 310—Growth and Development of Aerospace Power—3 cr. (3 and 1)

A study of current and planned space programs. Reviews the characteristics of the solar system and operating principles associated with the major components of space exploration systems. As in AS 309, course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training includes drill and ceremonies and the environment of the Air Force officer.

AS 409—Concepts of Air Force Leadership—3 cr. (3 and 1)

A study of military professionalism, leadership, and discipline. Covers leadership theory and practice. Compares leadership in the military with private enterprise. Flight instruction and ground school for pilot candidates. Corps Training provides cadets experience in the guidance, direction, and control of an Air Force unit.

AS 410—Concepts of Air Force Management—3 cr. (3 and 1)

A continuation of the study of professionalism with the stress on management principles and functions. An introduction to systems and approaches to decision making and resource control used in the Air Force. Includes participation in problem-situation exercises. The course concludes with instruction to prepare cadets for active duty in the Air Force. Corps Training emphasizes advanced leadership functions.

AGRICULTURAL ECONOMICS

Professors: L. M. Bauknight, Jr., W. J. Lanham, *Head;* J. M. Stepp

Associate Professors: A. B. Carroll, B. L. Dillman, J. W. Hubbard, H. C. Spurlock, G. R. von Tungelin

Assistant Professors: R. K. DeHaven, J. C. Hite, J. S. Lytle

Ag Ec 202—Agricultural Economics—3 cr. (3 and 0) F, S
An analytical survey of the various subdivisions of agricultural economics, to include farm organization, enterprise analysis, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy. *Prerequisite:* Econ 201.

Ag Ec 302—Agricultural Firm Management—3 cr. (2 and 3) F, S
Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is directed to management aspects of the farm as a production unit. *Prerequisite:* Ag Ec 202 or Econ 202.

Ag Ec 305—Agricultural Business Analysis—3 cr. (2 and 3) F, S
The principles of financial statement analysis applied to management of farms and other agricultural business firms. Emphasis is placed on enterprise analysis, profitability determination, and other aspects of internal financial operations. *Prerequisite:* Ag Ec 202 or Econ 202.

Ag Ec 309—Economics of Agricultural Marketing—3 cr. (3 and 0) F, S
A general course in marketing agricultural commodities, with particular emphasis upon food products. Efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions are analyzed. *Prerequisite:* Econ 201.

Ag Ec 351—Advertising and Merchandising—3 cr. (3 and 0) F, S
A general introduction to advertising and merchandising theories and some practice with basic techniques. A partial list of subjects covered includes: function of advertising, propriety in advertising, institutions, media, market research, consumer appeals, loss leaders, mass displays, trademarks and brands, writing copy, color, layout, agencies and integrated advertising campaigns. *Prerequisite:* Junior standing.

Ag Ec 352—Public Finance—3 cr. (3 and 0) F, S, SS
Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy.

Ag Ec 357—Natural Resource Economics—3 cr. (3 and 0) F, S, SS
The principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. *Prerequisite:* Econ 201.

Ag Ec 402—Economics of Agricultural Production—3 cr. (3 and 0) F
An economic analysis of agricultural production involving (a) the concept of the farm as a firm, (b) principles for decision making, (c) the quantitative nature and use of production and cost functions and their interrelations and

application of these principles to resource allocation on farms and among areas. *Prerequisite:* Permission of instructor.

AG EC 403—LAND ECONOMICS—3 cr. (3 and 0)
A study of the characteristics of land and of the physical, legal, social and economic principles and problems relating to the control and use of land resources. *Prerequisite:* Permission of instructor.

AG EC 405—SEMINAR—1 cr. (1 and 0) F
An examination of the relation of economics and sociology to specific problems. *Prerequisite:* Major in Agricultural Economics.

AG EC 406—SEMINAR—1 cr. (1 and 0) S
A continuation of Ag Ec 405.

AG EC 451—AGRICULTURAL COOPERATION—2 cr. (2 and 0) F
The principles and practices of business organization and management governing the successful operation of cooperative business enterprises. Major emphasis is placed upon cooperative selling, processing, purchasing, and service enterprises that serve farm people. *Prerequisite:* Econ 201.

AG EC 452—AGRICULTURAL POLICY—3 cr. (3 and 0) F, S
A review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Included are economic considerations as related to past and current farm price and income problems. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 456—PRICES—3 cr. (3 and 0) F, S
A review of the basic theory of price under competitive conditions and various modifications; nature, measurement and causes of daily, seasonal and cyclical price fluctuations; geographical price relationships; nature, function and behavior of futures markets; government price programs. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 460—AGRICULTURAL FINANCE—2 cr. (2 and 0) F, S
The financial needs of agriculture and of the organization, functions and interrelationships of agencies developed to meet these needs. *Prerequisite:* Econ 201.

AG EC 701—AGRIBUSINESS MANAGEMENT PRINCIPLES—3 cr. (3 and 0)

AG EC 602—ECONOMICS OF AGRICULTURAL PRODUCTION—3 cr. (3 and 0)

AG EC 603—LAND ECONOMICS—3 cr. (3 and 0)

AG EC 651—AGRICULTURAL COOPERATION—2 cr. (2 and 0)

AG EC 652—AGRICULTURAL POLICY—3 cr. (3 and 0)

AG EC 656—PRICES—3 cr. (3 and 0)

AG EC 660—AGRICULTURAL FINANCE—2 cr. (2 and 0)

AG EC 802—AGRICULTURAL PRODUCTION ECONOMICS PROBLEMS—3 cr. (3 and 0)

AG EC 804—WATER RESOURCE POLICIES—3 cr. (3 and 0)

AG EC 806—ECONOMIC DEVELOPMENT IN AGRICULTURAL AREAS—3 cr. (3 and 0)

Ag Ec 807—Market Structure in Agricultural Industries—3 cr. (3 and 0)

Ag Ec 808—Applied Quantifications in Agricultural Economics—3 cr. (3 and 0)

Ag Ec 814—Contemporary Economic Problems—3 cr. (3 and 0)

Ag Ec 851—Seminar in Research Methodology—1 cr. (1 and 0)

Ag Ec 891—Thesis Research—Credit to be arranged.

Ag Ec 904—Seminar in Resource Economics—3 cr. (3 and 0)

Ag Ec 906—Seminar in Area Economic Development—3 cr. (3 and 0)

Ag Ec 907—Agricultural Marketing Problems—3 cr. (3 and 0)

Ag Ec 991—Doctoral Research—Credit to be arranged.

AGRICULTURAL EDUCATION*

Professor: L. H. Davis, *Head*

Associate Professors: W. C. Bowen, E. T. Carpenter, F. E. Kirkley

Assistant Professor: J. A. Hash

Ag Ed 201—Introduction to Agricultural Education—3 cr. (2 and 2)
Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of farm people.

Ag Ed 401—Methods in Agricultural Education—3 cr. (2 and 2)
Appropriate methods of teaching vocational agriculture in high schools. The course includes procedures for organizing teaching programs, teaching high school students, and directing F. F. A. activities.

Ag Ed 406—Directed Teaching—6 cr. (0 and 18)
Guided participation in the professional responsibilities of a teacher of vocational agriculture including an intensive study of the problems encountered and the competencies developed. A half semester of directed teaching in selected schools is required. *Prerequisite:* Ag Ed 401 and Ag Ed 422.

Ag Ed 422—Introduction to Adult Education—3 cr. (2 and 2)
History and nature of adult education in the United States, with emphasis on adult education for rural people.

Ag Ed 431—Methods in Conservation Education—3 cr. (3 and 0)
A study of various techniques appropriate to teaching conservation. Instruction is applicable to both elementary and high school teachers. (Offered in Summer School only.)

Ag Ed 463—Advanced Conservation Education—3 cr. (3 and 0)
The broader aspects of conservation education. The course includes historical, geographical, and national conservation problems. (Offered in Summer School only.)

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* Jointly administered by the College of Education and the College of Agriculture and Biological Sciences.

Ag Ed 465—Program Development in Agricultural Education—3 cr. (3 and 0)

Each student will determine needs and resources in a specific community and plan a program to meet these needs.

Ag Ed 467—Adult Education in Agriculture—3 cr. (2 and 3)

Principles and practices appropriate to the solution of problems encountered in instructional programs for adult farmers.

Ag Ed 601—Methods in Agricultural Education—3 cr. (2 and 3)

Ag Ed 663—Advanced Conservation Education—3 cr. (3 and 0)

Ag Ed 665—Program Development in Agricultural Education—3 cr. (3 and 0)

Ag Ed 667—Adult Education in Agriculture—3 cr. (2 and 3)

Ag Ed 803—Evaluation in Agricultural Education—3 cr. (2 and 3)

Ag Ed 804—Special Problems—3 cr. (2 and 3)

Ag Ed 805—Administration and Supervision in Agricultural Education—3 cr. (3 and 0)

Ag Ed 815—Advanced Methods of Teaching Farm Mechanics—3 cr. (2 and 3)

Ag Ed 820—Teaching Young Farmers—3 cr. (3 and 0)

Ag Ed 825—Supervision of Student Teaching—3 cr. (3 and 0)

Ag Ed 869—Seminar—1-3 cr. (1-3 and 0)

Ag Ed 891—Introduction to Research in Education—3 cr.

AGRICULTURAL ENGINEERING*

Professors: T. H. Garner,† A. W. Snell, *Head;* T. V. Wilson

Associate Professors: C. L. Barth, C. E. Hood, Jr., J. R. Lambert, J. T. Ligon, E. B. Rogers, Jr., B. K. Webb

Assistant Professor: J. T. Craig

AgE 205—Farm Shop—3 cr. (2 and 3) S

Correct methods and underlying reasons in proper use and maintenance of hand and power tools are emphasized. Principal topics include: carpentry, painting and finishing, soldering and sheet metal work, farm concrete, pipe fitting and plumbing, and farm and home water supply systems.

AgE 206—Agricultural Mechanization—3 cr. (2 and 3) F, S

The agricultural student is taught to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Planning efficient operational systems and wise selection of equipment, based on function and economic suitability, are stressed. *Prerequisite:* Math 103, 104, Phys 207.

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* Jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.

† On leave.

AgE 212—Fundamentals of Mechanization—3 cr. (2 and 3) S
Functional analysis of selected agricultural equipment and the economic performance of machine systems; also, the utility and principles of applied technology and processes essential to providing a background for engineering design, research and development. *Prerequisite:* EG 109.

AgE 221—Soil and Water Resources Engineering I—3 cr. (2 and 3) F
Physical relationships of factors governing rainfall disposition are used as bases for defining the hydrology of agricultural watersheds. The surveying necessary for design and application of resource management measures and structures is taught. *Prerequisite:* Math 106.

AgE 301—Soil and Water Conservation—3 cr. (2 and 3) F
Engineering and agronomic principles are applied to water management in agriculture. Elementary surveying, mathematics, crops and soil fundamentals are embodied into principles and practices of erosion control, drainage, water conservation and irrigation. *Prerequisite:* Math 103, 104.

AgE 352—Farm Power—3 cr. (2 and 3) F and SS, '73 and alternate years.
Farm tractors and stationary power units. Principles of operation, preventive maintenance, adjustment and general repair are emphasized. *Prerequisite:* AgE 206.

AgE 353—Computational Systems—2 cr. (0 and 6) F
The fundamentals of computational systems including symbolic logic will be followed by methods and techniques of programming digital and analog computers to give solutions to agricultural engineering problems. *Prerequisite:* Math 208.

AgE 355—Engineering Analysis and Creativity—2 cr. (1 and 3) F
The creative and analytical portions of the engineering design process are developed in a problem approach. Application of physical and mathematical principles, analytical and experimental modeling and intelligent assumption making are stressed. Students are also introduced to the techniques of systems analysis. *Prerequisite:* Math 208 and Phys 221.

AgE 360—Farm and Home Utilities—3 cr. (2 and 3)
S and SS, '72 and alternate years.
A course for seniors and graduate students in agriculture curriculums, involving a study of electric and other utilities on the farm and in the home. Selection installation and maintenance of wiring systems, motors and controls, home water systems and sewage disposal systems are emphasized. *Prerequisite:* Junior standing.

AgE 362—Energy Conversion in Agricultural Systems—3 cr. (2 and 3)
S, '73 and alternate years.
The energy requirements of agricultural systems with emphasis upon energy conversion methods. Characteristics of various sources of energy will be considered including economic aspects. The present energy conversion mechanisms used in agriculture will be studied and their limitations considered. *Prerequisite:* ME 311.

AgE 416—Agricultural Machinery Design—3 cr. (2 and 3) S
Engineering analysis of machines and basic agricultural operations and systems requiring machine functions. Fundamentals of machine design with

applications to agricultural machinery. Velocity and acceleration, analyses, dimension determination, power transmission, and vibrations in machinery are studied. *Prerequisite:* EM 304.

AGE 422—SOIL AND WATER RESOURCES ENGINEERING II—3 cr. (2 and 3) S
Basic soil-water-plant relationships are used to establish criteria for the analysis and design of facilities and structures for conservation, water control, drainage and irrigation. Engineering relationships involved in the design of such facilities are emphasized. *Prerequisite:* Math 208 and EM 320.

AGE 431—AGRICULTURAL STRUCTURES DESIGN—3 cr. (2 and 3)
F, '71 and alternate years.
Analytic and synthetic design of building components, including fastening devices, as determined by both live and dead loads with emphasis on statically determinant members and their positions and utilization in frames and trusses. Major materials considered are wood, steel and concrete. *Corequisite:* EM 304.

AGE 442—AGRICULTURAL PROCESS ENGINEERING—3 cr. (2 and 3)
S, 72 and alternate years.
Design of unit operations components used in agricultural processing. Engineering principles and instrumentation as applied to control systems, heat transfer, materials handling, storage and related subjects are emphasized. *Prerequisite:* ME 311 and EE 308.

AGE 465—ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS—3 cr. (2 and 3) S, '73 and alternate years.
The thermal, electrical, mechanical, and chemical characteristics of biological materials, organisms, and metabolic processes are studied in relationship to engineering analysis and synthesis. The effects of environmental factors imposed by engineering processes are evaluated. *Prerequisite:* Math 208, EM 304, Biol 101.

AGE 471—UNDERGRADUATE RESEARCH—1 cr. (0 and 3) F
A course to acquaint senior students in Agricultural Engineering with the scientific method. Literature investigations, planning and executing of an experiment are integral parts of the course. *Prerequisite:* Senior standing in Agricultural Engineering.

AGE 473—SPECIAL TOPICS IN AGRICULTURAL ENGINEERING—3 cr. (3 and 0)
A comprehensive study of special topics in the field of agricultural engineering not covered in other courses. Special emphasis will be placed on independent pursuit of detailed investigations.

AGE H473—SPECIAL TOPICS IN AGRICULTURAL ENGINEERING—3 cr. (3 and 0)
Honors section of AgE 473; admission by invitation.

AGE 616—AGRICULTURAL MACHINERY DESIGN—3 cr. (2 and 3)

AGE 622—SOIL AND WATER RESOURCES ENGINEERING II—3 cr. (2 and 3)

AGE 631—AGRICULTURAL STRUCTURAL DESIGN—3 cr. (2 and 3)

AGE 642—AGRICULTURAL PROCESS ENGINEERING—3 cr. (2 and 3)

AGE 652—FARM POWER—3 cr. (2 and 3)

AGE 660—FARM AND HOME UTILITIES—3 cr. (2 and 3)

AgE 665—Engineering Properties of Biological Materials—3 cr. (2 and 3)

AgE 801—Special Problems in Agricultural Engineering—3 cr. (3 and 0)

AgE 806—Instrumentation in Agricultural and Biological Research—3 cr. (2 and 3)

AgE 811—Tillage and Soil Dynamics—3 cr. (3 and 0)

AgE 822—Water Movement in Soils—3 cr. (3 and 0)

AgE 865—Heat and Moisture Transfer in Biological Materials—3 cr. (3 and 0)

AgE 873—Radiological Health—3 cr. (2 and 3)

AgE 874—Radiological Health Engineering—3 cr. (2 and 3)

AgE 882—Systems Engineering—3 cr. (2 and 3)

AgE 891—Research—Credit to be arranged.

AgE 901—Special Problems in Agricultural Engineering—3 cr. (3 and 0)

AgE 991—Doctoral Research—Credit to be arranged.

AGRICULTURE

Professors: B. D. Barnett, J. W. Jones, U. S. Jones, W. A. King, W. J. Lanham, J. T. Lazar, Jr., R. R. Ritchie, T. L. Senn, R. F. Wheeler

Associate Professors: J. B. Cooper, M. W. Jutras, G. R. von Tungeln

Assistant Professors: R. K. DeHaven, B. J. Skelton

Agric 101—Introduction to Agriculture—1 cr. (1 and 0) F, S

Guides to effectively study; agricultural sciences; scope of the agricultural industry; agriculture of South Carolina and the United States; organization and function of the land-grant institution and other agencies serving agriculture; career opportunities.

Agric 201—Introduction to Animal Industries—3 cr. (2 and 3) F, S

Fundamental and descriptive aspects of the animal industries as applied biology and major segments of food production and distribution systems. The subject matter will be presented by Animal Science, Dairy Science and Poultry Science Departments.

Agric 202—Introduction to Plant Sciences—3 cr. (2 and 3) F, S

A fundamental course in plant sciences, including Agronomic and Horticultural crops of the major agricultural areas of the world, and emphasizing the crops of South Carolina. Included in the laboratory exercises are applications of the basic biological concepts of morphology, heredity, physiology and ecology to the production of food, fiber and ornamentals for an expanding population. The laboratory exercises are mostly self-tutorial; the students take the labs on their own, anytime during the semester at their own discretion.

Agric 301—International Agriculture—3 cr. (3 and 0) F

This course is designed to acquaint the student with current international agriculture. Topics covered include: international agricultural production and consumption patterns, stage of agricultural and industrial development in various countries of the world, current and projected future production-consumption-population balance, world trade patterns in agricultural products, world agricultural marketing problems (including tariffs, balance of trade, import quotas, and common markets). Also included are allied subjects such as population trends and agricultural mechanization.

Agric 401—International Agriculture Seminar—1 cr. (1 and 0) S
This seminar will be directed toward current topics in international agriculture. Seminar speakers will include invited guests from such agencies as the Foreign Agricultural Service, the Food and Agriculture Organization, The Ford Foundation, the Rockefeller Foundation, and the Agency for International Development. Other speakers will include staff members in the College of Agriculture and Biological Sciences that have had foreign assignments in their professional fields. Some sessions will be devoted specifically to employment opportunities in international agriculture.

AGRONOMY—CROPS AND SOILS

Professors: G. R. Craddock, C. M. Jones, U. S. Jones, *Head;* T. C. Peele

Associate Professors: E. B. Eskew, M. W. Jutras, K. S. LaFleur, B. J. Gossett

Assistant Professors: W. D. Graham, J. D. Maxwell, C. E. Rieck, J. R. Woodruff

Agron 202—Soils—3 cr. (2 and 2) F, S
A basic foundation in soil science is presented with emphasis on the chemical and physical properties of soil, the activities of the living soil organisms, and the origin and classification of soils. *Prerequisite:* Ch 101 and 102 or a geology sequence including Geol 201 or permission of the instructor.

Agron 301—Fertilizers—3 cr. (3 and 0) F
Mining, manufacture, and properties of minerals and chemicals that are sources of elements essential for plant growth. How these elements are taken by roots from the soil and converted to plants for food, fiber, shelter, and ornamentals.

Agron 308—Soil and Plant Analysis—3 cr. (1 and 6) S
A laboratory study of the physical and chemical properties of soils and methods of their determination. The relation of these properties to the potential fertility and management of soils is emphasized. Methods of plant analysis and the use of plant analysis data as a diagnostic tool in plant nutrition is also studied. *Prerequisite:* Agron 202.

Agron 320—Forage and Pasture Crops—3 cr. (3 and 0) S
The characteristics, establishment, utilization and maintenance of crops for hay, silage, and pasture. Crops valuable in South Carolina are emphasized. *Prerequisite:* Agric 202, Agron 202 or consent of instructor.

Agron 322—Forage Crops Laboratory—1 cr. (0 and 2) S
Identification, rating, and management of the important forage and pasture species of the Southeast. Research methodology is emphasized and a research problem required. *Prerequisite:* Agric 202.

AGRON 403—SOIL GENESIS AND CLASSIFICATION—2 cr. (1 and 3) F
Theoretical and practical phases of soil survey, formation and classification in relation to land usage and plant adaptability. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 405—PLANT BREEDING—3 cr. (2 and 2) S
The application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. *Prerequisite:* Gen 302.

AGRON 407—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2) F
Weeds, their introduction, ecology, methods of reproduction, dissemination, and control; chemistry and mode of action of herbicides, equipment and techniques of application; a characterization of the common weeds of the Southeast. *Prerequisite:* Agric 202, Agron 202 or consent of instructor.

AGRON 410—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0)
F, '71 and alternate years.
History, morphology, physiology, and fundamental principles and practices of production, harvesting, marketing, processing, and utilization of cotton and certain other fiber crops. Emphasis will be placed on the effect of environmental and production factors as they affect fiber quality and subsequent utilization. *Prerequisite:* Agric 202, Agron 202 or consent of instructor.

AGRON 411—GRAIN CROPS—2 cr. (2 and 0) F, '72 and alternate years.
A fundamental study involving principles of production, harvesting, processing, marketing, and untilization of soybeans, corn, sorghum, and the small grains. Emphasis will be placed on factors affecting grain quality as related to utilization of grain. *Prerequisite:* Agric 202, Agron 202 or consent of instructor.

AGRON 412—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0)
S, '72 and alternate years.
Principles involved in the production, harvesting, curing, grading and marketing of high quality flue-cured tobacco. Brief coverage of special use crops, such as peanuts, sugar cane, etc. *Prerequisite:* Agric 202, Agron 202 or consent of instructor.

AGRON 452—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0) S
Principles of crop rotations, soil fertility, soil management, and other factors necessary for the practical utilization of soils. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 455—SEMINAR—1 cr. (1 and 0) F
Student presentation of current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

AGRON 456—SEMINAR—1 cr. (1 and 0) S
Student presentation of current topics of special interest in the field of soil science appearing in recent scientific journals and other publications.

AGRON 601—FERTILIZERS—3 cr. (3 and 0)

AGRON 603—SOIL GENESIS AND CLASSIFICATION—2 cr. (1 and 3)

AGRON 608—SOIL AND PLANT ANALYSIS—3 cr. (1 and 6)

AGRON 605—PLANT BREEDING—3 cr. (2 and 2)

AGRON 607—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2)

AGRON 610—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0)

AGRON 611—GRAIN CROPS—2 cr. (2 and 0)

AGRON 612—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0)

AGRON 620—FORAGE AND PASTURE CROPS—3 cr. (3 and 0)

AGRON 622—FORAGE CROPS LABORATORY—1 cr. (0 and 2)

AGRON 652—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0)

AGRON 655—SEMINAR—1 cr. (1 and 0)

AGRON 656—SEMINAR—1 cr. (1 and 0)

AGRON 801—CROP PHYSIOLOGY AND NUTRITION—3 cr. (3 and 0)

AGRON 802—PEDOLOGY AND SOIL CLASSIFICATION—3 cr. (2 and 3)

AGRON 804—THEORY AND METHODS OF PLANT BREEDING—3 cr. (3 and 0)

AGRON 805—SOIL FERTILITY—3 cr. (3 and 0)

AGRON 806—SPECIAL PROBLEMS—Credit to be arranged—1-3 cr.

AGRON 807—SOIL PHYSICS—3 cr. (2 and 3)

AGRON 808—SOIL CHEMISTRY—3 cr. (2 and 3)

AGRON 812—CROP ECOLOGY AND LAND USE—3 cr. (3 and 0)

AGRON 820—PESTICIDE RESIDUES IN THE ENVIRONMENT—3 cr. (3 and 0)

AGRON 825—SEMINAR—1 cr. (1 and 0)

AGRON 891—RESEARCH—Credit to be arranged.

AGRON 991—DOCTORAL RESEARCH AND THESIS—Credit to be arranged.

ANIMAL PHYSIOLOGY

Professors: T. R. ADKINS, JR., B. D. BARNETT, M. A. BOONE, W. A. KING, R. F. WHEELER

Associate Professors: R. F. BORGMAN, J. F. DICKEY, S. B. HAYS, D. M. HENRICKS J. R. HILL, JR., G. C. SKELLEY, JR., A. S. TOMBES

Assistant Professors: RUTH L. HAYS, J. E. JONES, J. C. MCCONNELL, JR.

Visiting Professor: D. R. LAMOND

(See courses listed under Animal Science, Dairy Science, Entomology, Poultry Science, and Zoology)

AN PH 801—ELECTRON MICROSCOPY OF ANIMAL AND PLANT TISSUES—3 cr. (1 and 6)

AN PH 802—VERTEBRATE PHYSIOLOGY—3 cr. (2 and 3)

AN PH 803—ANIMAL PHYSIOLOGY—4 cr. (3 and 3)

AN PH 804—ANIMAL PHYSIOLOGY—4 cr. (3 and 3)

AN PH 805—PHARMACOLOGY—3 cr. (2 and 3)

AN PH 806—EXPERIMENTAL ANIMAL PHYSIOLOGY—3 cr. (1 and 6)

An Ph 807—Special Problems in Animal Physiology—1-3 cr.

An Ph 808—Mammalian and Avian Endocrinology—3 cr. (3 and 0)

An Ph 851—Animal Physiology Seminar I—1 cr. (1 and 0)

An Ph 852—Animal Physiology Seminar II—1 cr. (1 and 0)

An Ph 991—Doctoral Research—Credit to be arranged.

ANIMAL SCIENCE

Professors: W. C. Godley, R. R. Ritchie, R. F. Wheeler, *Head*
Associate Professors: R. L. Edwards, J. R. Hill, Jr., G. C. Skelley
Assistant Professors: D. L. Handlin, J. C. McConnell, Jr.

An Sc 201—Introduction to Animal Science—2 cr. (2 and 0)
This course deals with basic principles concerning the breeding, feeding, management and marketing of beef cattle, swine, sheep and horses.

An Sc 203—Introduction to Animal Science Laboratory—1 cr. (0 and 3)
A course designed to demonstrate the basic elements of livestock breeding, feeding and management. Beef cattle, swine, sheep and horses will be used. Evaluation of slaughter animals and carcasses is included.

An Sc 301—Feeds and Feeding—3 cr. (3 and 0) F, S
Feed nutrients, digestion, metabolism of feed stuffs, nutritive ratios, feeding standards, and the balancing of rations. *Prerequisite:* An Sc 201, 203 or equivalent and Ch 220 or consent of instructor.

An Sc 303—Feeds and Feeding Laboratory—1 cr. (0 and 3) S
Practical work in mixing and balancing rations and identifying feed stuffs. *Prerequisite:* An Sc 201, 203 or equivalent and Ch 220 or consent of instructor.

An Sc 305—Meat Grading and Selection—2 cr. (1 and 3)
F, '72 and alternate years.
Classification, grading and selection of beef, lamb and pork carcasses and wholesale cuts. Factors influencing quality and value. Students enrolled in this course are eligible to compete in Intercollegiate Meat Judging Contests. *Prerequisite:* An Sc 201, 203.

An Sc 306—Livestock Selection and Evaluation—2 cr. (1 and 3) S
Selection, breed characteristics and grading of beef cattle, sheep and swine. Students enrolled in this course are eligible to compete in the Southeastern Intercollegiate Livestock Judging Contest. *Prerequisite:* An Sc 201, 203.

An Sc 353—Meats—2 cr. (2 and 0) F
The chemical and physical composition of meat, meat hygiene; nutritive value; curing; freezing; and meat by-products. *Prerequisite:* An Sc 201, 203.

An Sc 355—Meats Laboratory—1 cr. (0 and 3) F
The selection and grading of meat animals and carcasses. Practical work in slaughtering of animals and in the cutting, curing and freezing of meats. Emphasis is placed on the identification of wholesale and retail cuts. *Prerequisite:* An Sc 201, 203.

AN SC 401—BEEF PRODUCTION—3 cr. (3 and 0) F
Breeding, feeding, management and grading of beef cattle. Emphasis is placed on year-round grazing. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 403—BEEF PRODUCTION LABORATORY—1 cr. (0 and 3) F
Practical application of beef production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 405—ADVANCED LIVESTOCK SELECTION AND EVALUATION—1 cr. (0 and 3) F, '71 and alternate years.
A continuation of An Sc 306 for students who are interested in participating in judging contests or in receiving special training in the selection of breeding cattle, sheep and swine. Judging and grading of market classes are considered. *Prerequisite:* An Sc 306.

AN SC 406—SEMINAR—2 cr. (2 and 0) S
Special problems in animal production. Each student is given a subject on which he makes weekly reports before a seminar group. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 407—HORSE AND SHEEP PRODUCTION—2 cr. (2 and 0) F, '72 and alternate years.
The breeding, feeding and care of horses and sheep; the shearing and marketing of sheep and wool; the adaptability of breeds; and parasite and disease control. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 408—PORK PRODUCTION—3 cr. (3 and 0) S
Feeding, breeding, management, and marketing of hogs. Emphasis is placed on winter and summer forages, protein supplements, mineral mixtures, and sanitation practices. In laboratory grading, selection, feeding, management and care of swine is given attention. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 409—HORSE AND SHEEP PRODUCTION LABORATORY—1 cr. (0 and 3) F, '72 and alternate years.
Horse and sheep production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 410—PORK PRODUCTION LABORATORY—1 cr. (0 and 3) S
Practical application of swine production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 452—ANIMAL BREEDING—3 cr. (3 and 0) S
The fundamental principles relating to the breeding and improvement of livestock including variation, heredity, selection, linebreeding, inbreeding, crossbreeding and other related subjects. *Prerequisite:* Gen 302.

AN SC 601—BEEF PRODUCTION—3 cr. (3 and 0)

AN SC 603—BEEF PRODUCTION LABORATORY—1 cr. (0 and 3)

AN SC 608—PORK PRODUCTION—3 cr. (3 and 0)

AN SC 610—PORK PRODUCTION LABORATORY—1 cr. (0 and 3)

AN SC 652—ANIMAL BREEDING—3 cr. (3 and 0)

AN SC 802—TOPICAL PROBLEMS—1-3 cr. (1-3 and 0)

AN SC 803—MEAT TECHNOLOGY—3 cr. (3 and 0)

An Sc 804—Methods in Animal Breeding—3 cr. (3 and 0)

An Sc 805—Nutrition of Meat Animals—3 cr. (3 and 0)

An Sc 891—Research—Credit to be arranged.

ARCHITECTURE

Professors: H. N. Cooledge, E. L. Falk, E. A. Gunnin, V. S. Hodges, R. H. Hunter, H. E. McClure, G. C. Means, J. L. Young

Associate Professors: J. T. Acorn, L. H. Brown, R. England, A. J. Kaufmann,* R. E. Knowland, P. Lee, M. G. Malaragno, J. E. Pinckney, I. G. Regnier, K. Russo, S. Wang, J. W. Wells, H. H. Williamson

Assistant Professors: K. E. Carpenter, J. McN. Clement, J. Dalton, F. K. Mooney, J. R. Washburn

Lecturers: S. Carter, K. R. Craig, F. P. Morris

Visiting Professors: M. L. Cetto, M. A. Clark

Visiting Associate Professor: B. D. Bray

Arch 101—An Introduction to Art and Architecture—3 cr. (0 and 9)
Studies of architecture and the visual arts with adjunct studio exercises.

Arch 102—An Introduction to Art and Architecture—3 cr. (0 and 9)
Studies of architecture and the visual arts with adjunct studio exercises. *Prerequisite:* Arch 101.

Arch Const 141—Elements of Building I—4 cr. (2 and 6)
An introduction to the principles of building construction. Exercises in graphics, slide rule, print reading and interpretation. Lectures in building materials, building codes, safety, and basic construction methods.

Arch Const 142—Elements of Building II—4 cr. (2 and 6)
A continuation of Arch Const 141. *Prerequisite:* Arch Const 141.

Arch Const 143—Elements of Building I—2 cr. (2 and 0)
An introduction to the principles of building construction; lectures in building materials, building codes, safety, and basic construction methods.

Arch Const 144—Elements of Building II—2 cr. (2 and 0)
A continuation of Arch Const 143. *Prerequisite:* Arch Const 143.

Arch Const 241—Elements of Building III—4 cr. (2 and 6)
Interpretation and analysis of working drawings and specifications of selected building projects. Principles of estimating procedures with emphasis on quantity surveys and construction organization and planning. *Prerequisite:* Arch Const 142.

Arch Const 242—Elements of Building IV—4 cr. (2 and 6)
Continuation of Arch Const 241. *Prerequisite:* Arch Const 241.

Arch 253—Basic Design I—4 cr. (0 and 12)
Studio problems in visual fundamentals, including graphic representations and adjunct lectures in visual theory. *Prerequisite:* Arch 102; *corequisite:* Math 206.

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* On leave.

ARCH 254—ARCHITECTURAL DESIGN II—4 cr. (0 and 12)
Studio problems in the elements of architecture, basic site development, and three-dimensional representation. *Prerequisite:* Arch 253; *corequisite:* EM 201.

ARCH 302—ART AND ARCHITECTURE TOUR—3 cr. (3 and 0)
A tour of selected cities, either foreign or American, will be organized periodically primarily in a Summer Session. The purpose of the tour is to provide students with firsthand experience with the dynamic qualities of original works of painting and sculpture and especially the spatial qualities of architecture and the relationships of great works of architecture to their environment. The tour will be accompanied by lectures and will require examinations and/or reports.

ARCH 303—THE EVOLUTION OF THE VISUAL ARTS—3 cr. (3 and 0)
A consideration of man's necessity for and development of the Visual Arts with particular attention to the environmental factors in society which demand Art as a medium of communication. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* Sophomore standing.

ARCH 304—THE EVOLUTION OF THE ENVIRONMENTAL ARTS—3 cr. (3 and 0)
A consideration of man's necessity for and development of the Environmental Arts (Architecture, Landscape Architecture, City and Regional Planning) with particular attention to the Total Environment of Man and its demands and restrictions upon the architect and planner. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* Arch 303 or special permission of instructor.

ARCH 315—ARCHITECTURAL HISTORY I—3 cr. (3 and 0)
The architectural history of Western man from 1500 B.C. to A.D. 323, with particular attention to Egypt, Greece, Mesopotamia, and Rome.

ARCH 316—ARCHITECTURAL HISTORY II—3 cr. (3 and 0)
The architectural history of Europe and the Near East from A.D. 323 to 1453, with particular attention to the Byzantine, pre-Romanesque, Romanesque, and Gothic schools of Western Europe. *Prerequisite:* Arch 315.

ARCH 331—ARCHITECTURAL APPLICATIONS OF COMPUTER SCIENCE—2 cr. (2 and 0)
A two-semester course sequence, including computer theory and programming. Architectural applications of the computer as a resource will be studied; including use in problem solving in functional relationships of space, materials performance specifications, structural design and graphic usage.

ARCH 332—ARCHITECTURAL APPLICATIONS OF COMPUTER SCIENCE—2 cr. (2 and 0)
A continuation of Arch 331. *Prerequisite:* Arch 331.

ARCH CONST 341—BUILDING CONSTRUCTION I—4 cr. (2 and 6)
A study of building construction projects with emphasis on labor relations and jurisdiction, job planning, scheduling, and project control. *Prerequisite:* Arch Const 242.

ARCH CONST 342—BUILDING CONSTRUCTION II—4 cr. (2 and 6)
A continuation of Arch Const 341. *Prerequisite:* Arch Const 341.

ARCH 353—ARCHITECTURAL DESIGN III—5 cr. (0 and 15)
Intermediate architectural design problems involving programming and considerations of function, structure and aesthetics. *Prerequisite:* Arch 254; *corequisite:* EM 304.

ARCH 354—ARCHITECTURAL DESIGN IV—5 cr. (0 and 15)
Continuation of Arch 353. *Prerequisite:* Arch 353; *corequisite:* CE 301.

ARCH 415—ARCHITECTURAL HISTORY III—3 cr. (3 and 0)
The architectural history of Western Europe and the Americas from 1453 to 1775, with particular attention to the Renaissance, Baroque, and Revivalist schools. *Prerequisite:* Arch 316.

ARCH 416—ARCHITECTURAL HISTORY IV—3 cr. (3 and 0)
The architectural history of Western Europe and the Americas from 1775 to 1915 with particular attention to the architecture of the Industrial Revolution and the development of the academies. *Prerequisite:* Arch 415.

ARCH CONST 432—CONCRETE FORMWORK—2 cr. (2 and 0)
The study of materials, methods, design and estimating of formwork for concrete structures. *Prerequisite:* CE 301.

ARCH CONST 441—BUILDING CONSTRUCTION III—4 cr. (2 and 6)
A study of contractor organization and administration including contracts, insurance, bonds, financing, equipment, office procedures, and records. *Prerequisite:* Arch Const 342.

ARCH CONST 442—BUILDING CONSTRUCTION IV—4 cr. (2 and 6)
A continuation of Arch Const 441. *Prerequisite:* Arch Const 441.

ARCH 453—ARCHITECTURAL DESIGN V—5 cr. (0 and 15)
Consideration of design problems involving programming of urban structures with adjunct lectures in design principles, construction and theory. *Prerequisite:* Arch 354; *corequisite:* CE 302.

ARCH 454—ARCHITECTURAL DESIGN VI—5 cr. (0 and 15)
Continuation of Arch 453. *Prerequisite:* Arch 453; *corequisite:* CE 402.

ARCH 490—DIRECTED STUDIES—1 to 5 cr.
Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in architecture.

ARCH 503—SEMINAR IN THE ANALYSIS AND CRITICISM OF ARCHITECTURAL AND TOWN BUILDING WORKS—3 cr. (3 and 0)
A seminar in the analysis and criticism of architectural and town building works. The course sequence will include historic and contemporary examples, literary searches, field trips, essays and oral reports. Fourth-year-design standing or permission of instructor.

ARCH 517—STUDIES IN THE ART AND ARCHITECTURE OF THE ANCIENT WORLD I—3 cr. (3 and 0) F
A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece and Rome), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and Hist 171, 172, 173, all with a grade of "B" or better.

ARCH 518—STUDIES IN THE ART AND ARCHITECTURE OF THE ANCIENT WORLD II—3 cr. (3 and 0) S
A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece and Rome), with a study in depth of selected examples from the period. *Prerequisite:* Arch 517, or with the permission of the instructor and the prerequisites for Arch 517.

ARCH 519—STUDIES IN THE ART AND ARCHITECTURE OF THE EARLY MIDDLE AGES I—3 cr. (3 and 0) F
A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and Hist 171, 172, 173, all with a grade of "B" or better.

ARCH 520—STUDIES IN THE ART AND ARCHITECTURE OF THE EARLY MIDDLE AGES II—3 cr. (3 and 0) S
A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 519, or with the permission of the instructor and the prerequisites for Arch 519.

ARCH 521—STUDIES IN THE ART AND ARCHITECTURE OF THE LATE MIDDLE AGES I—3 cr. (3 and 0) F
A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and Hist 171, 172, 173, all with a grade of "B" or better.

ARCH 522—STUDIES IN THE ART AND ARCHITECTURE OF THE LATE MIDDLE AGES II—3 cr. (3 and 0) S
A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 521, or with the permission of the instructor and the prerequisites for Arch 521.

ARCH 523—STUDIES IN THE ART AND ARCHITECTURE OF THE RENAISSANCE I—3 cr. (3 and 0) F
A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and Hist 171, 172, 173, all with a grade of "B" or better.

ARCH 524—STUDIES IN THE ART AND ARCHITECTURE OF THE RENAISSANCE II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th Centuries), with a study in depth of selected examples from the period. *Prerequisite:* Arch 523, or with the permission of the instructor and the prerequisites for Arch 523.

ARCH 525—STUDIES IN THE ART AND ARCHITECTURE OF THE TECHNOLOGICAL REVOLUTION I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of the Technological Revolution (Western Europe and America from 1685 to 1935), with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and Hist 171, 172, 173, all with a grade of "B" or better.

ARCH 526—STUDIES IN THE ART AND ARCHITECTURE OF THE TECHNOLOGICAL REVOLUTION II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of the Technological Revolution (Western Europe and America from 1685 to 1935), with a study in depth of selected examples from the period. *Prerequisite:* Arch 525, or with the permission of the instructor and the prerequisites for Arch 525.

ARCH 527—STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL TECHNOLOGY I—3 cr. (3 and 0) F

A consideration of the development of architectural technology from ancient through contemporary times with a study in depth of selected examples from each period. *Prerequisite:* Open to students who have completed Architectural History I-IV and to other students with senior standing and permission of the instructor.

ARCH 528—STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL TECHNOLOGY II—3 cr. (3 and 0) S

A consideration of the development of architectural technology from ancient through contemporary times with a study in depth of selected examples from each period. *Prerequisite:* Open to students who have completed Architectural History I-IV and to other students with senior standing and permission of the instructor.

ARCH 529—STUDIES IN THE ART AND ARCHITECTURE OF INDIA AND THE FAR EAST I—3 cr. (3 and 0) F

A consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period. *Prerequisite:* Arch 315, 316, 415, 416, or Arch 303, 304 and Hist 171, 172, 173, all with a grade of "B" or better.

ARCH 530—STUDIES IN THE ART AND ARCHITECTURE OF INDIA AND THE FAR EAST II—3 cr. (3 and 0) S

A consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period. *Prerequisite:* Arch 529, or with the permission of the instructor and the prerequisites for Arch 529.

ARCH 553—ADVANCED ARCHITECTURAL STRUCTURES—4 cr. (1 and 9)

A course in the synthesis of advanced architectural construction and structural analysis. *Prerequisite:* Arch 515 and CE 302.

ARCH 575—MECHANICAL PLANT—2 cr. (2 and 0)
The water supply, plumbing, heating and ventilating systems of present-day buildings.

ARCH 576—MECHANICAL PLANT—2 cr. (2 and 0)
Air-conditioning, electrical systems, lighting, mechanical transportation and acoustics as applied to contemporary buildings. *Prerequisite:* Arch 575.

ARCH 581—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)
General consideration of architectural office procedure. Study of the professional relationship of the architect to client and contractor, including problems of ethics, law, and business.

ARCH 582—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)
A continuation of Arch 581. *Prerequisite:* Arch 581.

ARCH 591—ARCHITECTURAL AND TOWN PLANNING DESIGN—11 cr. (5 and 18)
Lectures and studio problems in advanced architectural design and Town Planning. Course content will include pre-thesis studies. *Prerequisite:* Arch 452 with C standing.

ARCH 592—ARCHITECTURAL THESIS—11 cr. (5 and 18)
The student working individually will carefully program an environmental problems of appropriate scope, and conduct his own comprehensive research. He will make a complete oral, written and visual presentation of his solution. *Prerequisite:* Arch 591.

ARCH 593—STRUCTURAL THESIS RESEARCH—5 cr. (0 and 15)
Studio and laboratory research studies preliminary to undertaking a thesis in Architectural Structures. *Prerequisite:* Arch 553.

ARCH 594—THESIS IN ARCHITECTURAL STRUCTURES—11 cr. (5 and 18)
The student working individually with laboratory and lecture support will prepare and present a structural thesis of appropriate scope and complexity. *Prerequisite:* Arch 593.

ARCH 611—DIRECTED RESEARCH IN ART HISTORY—3 cr. (3 and 0)

ARCH 612—DIRECTED RESEARCH IN ART HISTORY—3 cr. (3 and 0)

ARCH 615—CONSTRUCTION METHODS—2 cr. (2 and 0)

ARCH 853—GRADUATE ARCHITECTURAL DESIGN—8 cr. (3 and 15)

ARCH 854—GRADUATE ARCHITECTURAL DESIGN—8 cr. (3 and 15)

ARCH 855—THESIS RESEARCH—2 cr. (0 and 6)

ARCH 857—GRADUATE ARCHITECTURAL DESIGN—10 cr. (4 and 18)

ARCH 858—ARCHITECTURAL THESIS—17 cr. (5 and 36)

ARCH 861—ECONOMIC SEMINARS—3 cr. (3 and 0)

ARCH 875—MECHANICAL PLANT—2 cr. (2 and 0)

ARCH 876—MECHANICAL PLANT—2 cr. (2 and 0)

ARCH 881—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)

ARCH 882—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)

ARCH 890—DIRECTED STUDIES—1-5 cr.

ARCH 891—ARCHITECTURAL STRUCTURAL SEMINAR—2 cr. (2 and 0)

ARCH 892—ARCHITECTURAL STRUCTURAL SEMINAR—2 cr. (2 and 0)

ARCH 893—ARCHITECTURAL STRUCTURES SEMINAR—2 cr. (2 and 0)

BIOCHEMISTRY

(See also Biology)

Professors: J. H. MITCHELL, JR., W. P. WILLIAMS, JR.

Associate Professors: R. F. BORGMAN, D. M. HENDRICKS, D. E. TURK, J. M. SHIVELY, *Chairman*

Assistant Professors: L. CROOK, J. J. JEN

(See biochemistry courses listed under Chemistry)

BIOCH 301—MOLECULAR BIOLOGY—3 cr. (3 and 0) F
An introduction to the nature, production, and replication of biological structure at the molecular level, and its relation to function. *Prerequisite:* Organic chemistry.

BIOCH 406—PHYSIOLOGICAL CHEMISTRY—4 cr. (3 and 3) S
Chemistry of the physiological processes of respiration, digestion, membrane transport, blood and tissue homeostatis, and kidney function is studied. Current literature on these processes is studied and interpretations discussed. *Prerequisite:* Ch 310 or Bioch 423.

BIOCH 423—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)
The study of the organic chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines and associated compounds leads to a fuller understanding of the chemical properties of proteins, carbohydrates, lipids, and nucleic acids that made them so important in biological processes. Relationships between the structure and function of these molecules and the modern techniques used to establish them are stressed. *Prerequisite:* Ch 224 or equivalent.

BIOCH 424—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)
A continuation of Bioch 423.

BIOCH 425—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)
Experiments selected to illustrate current methods used in biochemical research.

BIOCH 426—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)
A continuation of Bioch 425.

BIOCH 491—SPECIAL PROBLEMS IN BIOCHEMISTRY—1-3 cr. (0 and 3-9) SS
Orientation, i. e., experimental planning, execution, and reporting in biochemical research. *Prerequisite:* Senior standing and permission of chairman.

BIOCH 606—PHYSIOLOGICAL CHEMISTRY—4 cr. (3 and 3)

BIOCH 623—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)

BIOCH 624—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)

BIOCH 625—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)

BIOCH 626—GENERAL BIOCHEMISTRY LABORATORY—1 cr. (0 and 3)

BIOCH 810—ADVANCED BIOCHEMICAL TECHNIQUES—3 cr. (1 and 6)

BIOCH 815—LIPIDS—2 cr. (2 and 0)

BIOCH 817—CHEMISTRY AND METABOLISM OF HORMONES—2 cr. (2 and 0)

BIOCH 819—INTERMEDIARY METABOLISM—3 cr. (3 and 0)

BIOCH 820—NUCLEIC ACIDS—2 cr. (2 and 0)

BIOCH 821—PROTEINS—2 cr. (2 and 0)

BIOCH 822—ENZYMES—3 cr. (3 and 0)

BIOCH 823—CARBOHYDRATES—2 cr. (2 and 0)

BIOCH 851—BIOCHEMISTRY SEMINAR—1 cr. (1 and 0)

BIOCH 852—BIOCHEMISTRY SEMINAR—1 cr. (1 and 0)

BIOCH 891—RESEARCH—Credit to be arranged.

BIOENGINEERING

Professors: D. W. BRADBURY, H. R. BUNGAY III, R. C. HARSHMAN, L. C. WILCOX, T. T. YANG

Associate Professors: W. B. BARLAGE, D. F. BRULEY, M. J. EITEL, B. E. GILLILAND, S. F. HULBERT, *Program Coordinator;* J. S. WOLF, M. L. WOLLA

Assistant Professors: D. C. AMOSS, J. J. KLAWITTER, J. E. LEMONS, R. R. MOORE, B. W. SAUER

Adjunct Professors: J. R. PRUITT, F. H. STELLING

BIOE 301—ENGINEERING ASPECTS OF BIOLOGY AND MEDICINE—2 cr. (2 and 0)
The relationships of various branches of engineering to biology and medicine. Structural engineering fluid flow, and mass transfer in living systems. Artificial organs, biomaterials, implants, instrumentation, microbial systems, and other engineering challenges are discussed.

BIOE 401—COMPUTERS FOR BIOSCIENTISTS—1 cr. (1 and 0)
Analog and digital simulation of biochemical and biological processes. Systems approaches, dynamic analysis, interactions between laboratory research and computer models. *Prerequisite:* One semester of calculus or permission of instructor.

BIOE 601—COMPUTERS FOR BIOSCIENTISTS—1 cr. (1 and 0)

BIOE 800—SEMINAR IN BIOENGINEERING—1 cr. (1 and 0)

BIOE 801—BIOMATERIALS—3 cr. (3 and 0)

BIOE 810—BIOCHEMICAL ENGINEERING—3 cr. (3 and 0)

BIOE 812—BIOELECTROCHEMISTRY—3 cr. (3 and 0)

BIOE 846—ELEMENTS OF BIOENGINEERING I—3 cr. (3 and 0)

BIOE 847—ELEMENTS OF BIOENGINEERING II—3 cr. (3 and 0)

BIOE 850—SPECIAL TOPICS IN BIOMEDICAL ENGINEERING—3 cr. (3 and 0)

BIOE 860—ECOLOGICAL MODELS—3 cr. (2 and 3)

BIOE 870—BIOINSTRUMENTATION—3 cr. (2 and 2)

BIOE 891—RESEARCH—Credit to be arranged.

BioE 980—Internship—1-5 cr. (5-0 and 0-40)

BioE 991—Doctoral Research—Credit to be arranged.

BIOLOGY

(For curriculums and offerings of sections of the Division of Biology see also Biochemistry, Botany, Microbiology, and Zoology)

Professor: R. K. Guthrie, *Director*

Biol 101—Principles of Biology—3 cr. (3 and 0) F, S, SS

The chemical, structural, and functional principles of living cells. Consideration of the chemical and physical composition of protoplasm as related to the function of this living material in basic biological processes. The principles of genetics, ecology, and evolution.

Biol 450—Biology for High School Teachers—3 cr. (3 and 0) SS

The fundamental principles of biological processes are reviewed and expanded. Demonstrations, preparations, illustrations, and experiments suitable for use in high school teaching are emphasized. Expressly designed for biology teachers in the secondary schools.

Biol 491—Special Problems in Biology—2 cr. (0 and 6) F, S, SS

Research problems in selected biological disciplines to provide initiation to research planning and techniques for biological science majors. *Prerequisite:* Senior standing and permission of the appropriate section chairman.

Biol 650—Biology for High School Teachers—3 cr. (3 and 0)

Biol 800—Principles of Biology—3 cr. (2 and 3)

Biol 801—Electron Microscopy of Biological Material—3 cr. (3 and 0)

BOTANY

(See also Biology)

Professors: R. P. Ashworth, A. C. Mathews, J. B. Whitney, Jr.

Assistant Professors: N. D. Camper, J. E. Fairey III, C. J. Umphlett, *Chairman*

Instructor: C. R. Dillon

Bot 102—Principles of Botany—2 cr. (2 and 0) F, S, SS

The application of biological principles to plants as exemplified by the structures and functions of vascular plants. Followed by a survey of the plant kingdom. *Prerequisite:* Biol 101.

Bot 104—Laboratory Exercises in Botany—1 cr. (0 and 2) F, S, SS

Demonstrations and experiments to illustrate the structures and functions of plants considered in Bot 102.

Bot 145—Environmental Dynamics—2 cr. (2 and 0) F

A non-technical, non-laboratory course designed to instill a sense of appreciation for the finiteness of our planet and the extent to which it may be exploited. Introduction will be made to basic concepts underlying population growth characteristics, genetic adaptations, energy relationships between producers and consumers, the description of pollutants and their causes and effects. A survey will be made of the various types of environments.

Bot 202—Survey of the Plant Kingdom—4 cr. (3 and 3) S
A survey of the major groups of plants, their structure, development, and reproduction. Evolutionary relationships as exemplified by comparisons of body organization and life cycles will be emphasized. *Prerequisite:* Bot 102.

Bot 352—Plant Physiology—4 cr. (3 and 3) F, S
The relations and processes which have to do with the maintenance, growth and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. *Prerequisite:* Bot 102; Ch 101 and 102; Phys 207 or Phys 211 and 213.

Bot H352—Plant Physiology—4 cr. (3 and 3) F, S
Honors option for Bot 352, admission by special arrangement.

Bot 355—Histology—2 cr. (0 and 6)
The principles of fixing, cutting and staining plant tissues and the various other processes of micro-technique and their application to specific forms of plants with emphasis on the flora of South Carolina. *Prerequisite:* Bot 102.

Bot 356—Taxonomy of Vascular Plants—3 cr. (1 and 6) S
The identification, classification, distribution and interrelationship of vascular plants with emphasis on the flora of South Carolina. *Prerequisite:* Bot 101.

Bot H356—Taxonomy of Vascular Plants—3 cr. (1 and 6) S
Honors option for Bot 356, admission by special arrangement.

Bot 404—Cytology—3 cr. (3 and 0) F, '71 and alternate years.
A detailed consideration of the morphology and ultrastructures of cells. *Prerequisite:* Bot 352; Zool 102, 104, or permission of instructor.

Bot H404—Cytology—3 cr. (3 and 3) F, '71 and alternate years.

Bot 406—Plant Anatomy—3 cr. (2 and 3) F, '70 and alternate years.
The origin and development of the organs and tissue systems of vascular plants and a comparative study of the structure of roots, stems, leaves, flowers, and fruits. *Prerequisite:* Bot 102.

Bot H406—Plant Anatomy—3 cr. (2 and 3) F, '70 and alternate years.
Honors option for Bot 406, admission by special arrangement.

Bot 451—Morphology of the Fungi—3 cr. (2 and 3)
F, '70 and alternate years.
The morphology and taxonomy of the fungi, with special emphasis on species of economic importance. *Prerequisite:* Bot 102.

Bot 455—Vascular Plant Morphology—3 cr. (2 and 3) S
Consideration of the structure, reproduction, and phylogenetic relationships of representative vascular plants. *Prerequisite:* Bot 102 and 202.

Bot 457—Phycology—3 cr. (2 and 3) S, '71 and alternate years.
The taxonomy, morphology, and ecology of freshwater algae with emphasis on the local flora. *Prerequisite:* Bot 102 or permission of instructor.

Bot H457—Phycology—3 cr. (2 and 3) S, '71 and alternate years.
Honors option for Bot 457, admission by special arrangement.

Bot 459—Plant Ecology—3 cr. (2 and 3) S
The fundamental principles of the relations between plants and their environment. Although autecology is discussed, the basic emphasis throughout the course is synecology. *Prerequisite:* Bot 102.

Bot H459—Plant Ecology—3 cr. (2 and 3) S
The honors option of Bot 459. Admission by special arrangement.

Bot 604—Cytology—3 cr. (3 and 0)

Bot 606—Plant Anatomy—3 cr. (2 and 3)

Bot 651—Morphology of the Fungi—3 cr. (2 and 3)

Bot 652—Plant Physiology—4 cr. (3 and 3)

Bot 656—Taxonomy of Vascular Plants—3 cr. (1 and 6)

Bft 657—Phycology—3 cr. (2 and 3)

Bot 659—Plant Ecology—3 cr. (2 and 3)

Bot 802—Mycology—4 cr. (3 and 3)

Bot 805—Special Problems in Botany—Credit to be arranged.

Bot 807—Seminar—1 cr. (1 and 0)

Bot 811—Inorganic Plant Metabolism—4 cr. (3 and 3)

Bot 812—Organic Plant Metabolism—3 cr. (3 and 0)

Bot 813—Plant Growth and Development—3 cr. (3 and 0)

Bot 821—Plant Taxonomy I—4 cr. (2 and 6)

Bot 822—Plant Taxonomy II—4 cr. (2 and 6)

Bot 891—Research—Credit to be arranged.

Bot 991—Doctoral Research—Credit to be arranged.

CERAMIC ARTS

Professor: G. C. Robinson

Cr Ar 101—Pottery Materials—3 cr. (2 and 3)
The occurrence and properties of pottery raw materials. Attention is devoted to the occurrence of natural pottery materials in South Carolina, and the methods and equipment used in preparing these materials.

Cr Ar 102—Pottery Drying and Firing—3 cr. (3 and 0)
The drying and firing processes used in pottery making. A discussion is included on the design and construction of simple pottery kilns and the student is required to build and operate a small outdoor kiln. The laboratory work demonstrates the drying and firing behavior of pottery.

Cr Ar 301—Pottery Glazes—3 cr. (3 and 0)
The materials and methods used in preparing glazes and a study of the methods used in decorating pottery products. *Prerequisite:* Cr Ar 101 and 102.

Cr Ar 401—Advanced Pottery—3 cr. (2 and 3)
The student is given advanced training in pottery techniques and pottery equipment. *Prerequisite:* Cr Ar 101 and 102.

CERAMIC ENGINEERING

Professors: G. C. Robinson, *Head;* H. H. Wilson

Associate Professors: W. W. Coffeen, C. C. Fain, H. G. Lefort

CrE 201—Introduction to Ceramic Engineering—2 cr. (2 and 0)
An introduction to ceramic engineering together with a study of ceramic forming operation. Exercises are provided in the analysis of processing problems, the evaluation of background information and the creation of new solutions to processing problems.

CrE 202—Ceramic Materials—3 cr. (3 and 0)
The properties and uses of commonly used ceramic materials. Equilibrium diagrams are used to gain an understanding of the effect of heat on the materials.

CrE 204—Laboratory Procedures—1 cr. (0 and 3)
An introduction to ceramic laboratory procedures. Primary consideration will be given to the evaluation of sources of error and signifiance of measurement in the major ceramic test procedures.

CrE 299—Digital Computation—1 cr. (0 and 3)
An introduction to digital computer programming for students majoring in Ceramic Engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in ceramic engineering. *Prerequisite:* Sophomore standing.

CrE 302—Thermo-Chemical Ceramics—3 cr. (3 and 0)
High-temperature equilibrium using the laws of physical chemistry as applied to ceramic systems in both solid and liquid states. An introduction to the crystal chemistry of ceramic raw materials, and the effect of crystalline form on their high-temperature behavior.

CrE 303—Ceramic Products—2 cr. (2 and 0)
The application of ceramic products to a variety of use environments. Refractories, structural ceramics, coated metals and corrosion resistant products are included. The course is for both engineering and non-engineering majors.

CrE 304—Experiment Design—1 cr. (0 and 3)
An exercise in the planning and organization of experiments in the ceramic field.

CrE 306—Fuels Combustion and Heat Transfer—1 cr. (0 and 3)
Combustion devices, the calculation of combustion problems and heat transfer.

CrE 307—Thermal Processing of Ceramics—3 cr. (3 and 0)
The accomplishment of changes in structure and composition through the application of thermal energy. The course includes a study of simultaneous transfer of heat and mass, fluid flow, determinants of rates in a variety of reactions and calculations of the energy requirements to accomplish change in structure or composition.

CrE 309—Research Methods—2 cr. (0 and 6)
The planning and solution of selected research problems.

CrE 310—INTRODUCTION TO MATERIAL SCIENCE—3 cr. (3 and 0)

A beginning course in material science designed primarily for engineering students. The course is a study of the relation between the electrical, mechanical and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms.

CrE 320—EXPERIMENTS IN MATERIAL SCIENCE FOR TEACHERS—3 cr. (2 and 3)

Many of the topics in the earth science, physical science, physics and chemistry courses of grammar school and high school have interesting application in research and production of ceramics, metals and polymers. A series of experiments have been developed which support specific topics in grammar and high school science courses. These experiments have been designed to be suitable for use in schools and with equipment usually present in school laboratories. The laboratory part of this course is devoted to providing the students with experience and background in these experiments while the lecture topics include consideration of the thermal, electrical, chemical properties of materials as determined by their composition and structure. This course has been prepared especially for elementary and high school teachers of science.

CrE 402—SOLID STATE CERAMICS—3 cr. (3 and 0)

The effects of the composition, form, and shape of ceramic raw materials on the manufacturing processes and final properties of ceramic products. Included are fundamental studies of such phenomena as deflocculation, plasticity, sintering and the behavior of ceramic products in electrical circuits. *Prerequisite:* Junior standing.

CrE 403—GLASSES—3 cr. (3 and 0)

Glass structure and composition and their relation to the properties of glasses. Consideration is given to the processing variables which control the properties of glasses including glass products, enamels, glazes and vitreous bonds.

CrE 404—CERAMIC COATINGS—3 cr. (3 and 0)

The raw materials, methods of manufacture, and properties of ceramic coatings. *Prerequisite:* CrE 302.

CrE 406—CERAMIC PROJECT—2 cr. (0 and 6)

The completion of an original research into a ceramic problem. *Prerequisite:* CrE 302.

CrE 407—PLANT DESIGN—3 cr. (1 and 6)

The application of the fundamentals of ceramic engineering to problems in plant design. *Prerequisite:* Senior standing in Ceramic Engineering.

CrE 410—ANALYTICAL PROCESSES—3 cr. (2 and 3)

An introductory course on the theory and use of X-ray diffraction and spectroscopic methods. *Prerequisite:* Junior standing.

CrE 412—RAW MATERIAL PREPARATION—3 cr. (3 and 0)

The equipment and processes used in the crushing and grinding of raw materials, the separation and classification of particle sizes, and the separation and purification of minerals by mineral dressing methods.

CrE 416—Electronic Ceramics—3 cr. (3 and 0)
The theory and measurement of the electronic properties of ceramic products.

CrE 418—Process Control—3 cr. (3 and 0)
Process control techniques and apparatus with particular emphasis on temperature measurement and control systems. The application of laboratory techniques to the control of product quality and process efficiency is included. *Prerequisite:* Junior standing.

CrE 419—Science of Engineering Materials—3 cr. (3 and 0)
This course is planned to acquaint engineers with the thermal, electrical, and chemical characteristics of engineering materials. It emphasizes fundamental consideration of the structure of matter in the solid and glassy states, solid state reactions, and the influence of particle and aggregate structure to speed of reaction and product properties. The reasons for the properties of materials at elevated temperatures and room temperatures are related to these fundamentals.

CrE H419—Science of Engineering Materials—3 cr. (3 and 0)
Same as CrE 419 except that this honors section is open to students only by invitation.

CrE 420—Science of Engineering Materials—3 cr. (3 and 0)
A continuation of CrE 419 with emphasis on applications of fundamentals in nuclear reactors and nuclear power plants. Consideration is given to the development of ceramics for fuel elements, moderator materials, control rods, shielding and in radioactive waste disposal.

CrE 602—Solid State Ceramics—3 cr. (3 and 0)

CrE 603—Glasses—3 cr. (3 and 0)

CrE 604—Ceramic Coatings—3 cr. (3 and 0)

CrE 610—Analytical Processes—3 cr. (2 and 3)

CrE 612—Raw Material Preparation—3 cr. (3 and 0)

CrE 616—Electronic Ceramics—3 cr. (3 and 0)

CrE 618—Process Control—3 cr. (3 and 0)

CrE 619—Science of Engineering Materials—3 cr. (3 and 0)

CrE 620—Science of Engineering Materials—3 cr. (3 and 0)

CrE 807—Specialized Ceramics—3 cr. (3 and 0)

CrE 809—High-Temperature Materials—3 cr. (3 and 0)

CrE 810—Ceramic Engineering Thermodynamics—3 cr. (3 and 0)

CrE 811—Ceramic Engineering Kinetics—3 cr. (3 and 0)

CrE 812—Current Topics in Ceramic Engineering—1 cr. (1 and 0)

CrE 813—Nuclear Ceramics—3 cr. (3 and 0)

CrE 814—Ceramic Physical Processing—3 cr. (3 and 0)

CrE 815—Colloidal and Surface Science—3 cr. (3 and 0)

CrE 816—Constitution and Structure of Glasses—3 cr. (3 and 0)

CrE 821—Analytical Procedures and Equipment I—3 cr. (2 and 3)

CrE 822—Analytical Procedures and Equipment II—3 cr. (2 and 3)

CrE 823—Thermal Properties of Ceramic Materials—3 cr. (3 and 0)

CrE 824—Mechanical Properties of Ceramic Materials—3 cr. (3 and 0)

CrE 825—Magnetic and Electrical Ceramic Material—3 cr. 3 and 0)

CrE 826—Ceramic Coatings—3 cr. (3 and 0)

CrE 828—Solid State Ceramic Science—3 cr. (3 and 0)

CrE 891—Research—Credit to be arranged.

CHEMICAL ENGINEERING

Professors: C. E. Littlejohn, *Head;* F. C. Alley, J. W. Hall, R. C. Harshman

Associate Professors: W. B. Barlage, W. F. Beckwith, D. F. Bruley, J. C. Mullins

Assistant Professor: S. S. Melsheimer

ChE 204—Introduction to Chemical Engineering I—2 cr. (1 and 3)
Designed to acquaint students with the profession of Chemical Engineering and to introduce them to certain basic concepts and methods used by the chemical engineer. Topics include the chemical engineering literature, graphical methods of presenting data, graphical solutions to problems, fundamental units and dimensions, process variables, stoichiometry, and PVT relations for gases. *Prerequisite:* Ch 102 and Math 108.

ChE 205—Introduction to Chemical Engineering II—3 cr. (2 and 3)
A continuation of ChE 204. Topics include properties of mixtures of gases and vapors, material and energy balances, equilibria in chemical systems, dimensional analysis, economic considerations, and an introduction to stagewise calculations involving solvent extraction. *Prerequisite:* ChE 204.

ChE 210—Digital Computation and Numerical Methods—3 cr. (3 and 0)
An introduction to digital computational techniques using a specific procedure oriented language and the use of numerical methods for the solution of chemical engineering problems. The course will introduce students to computational methods to be used in subsequent chemical engineering courses. *Prerequisite:* ChE 204 and Math 108.

ChE 301—Unit Operations Theory I—3 cr. (3 and 0)
The general principles of Chemical Engineering and a study of the following unit operations: Fluid Flow, Fluid Transportation, Heat Transmission and Evaporation. Special emphasis is placed on theory and its practical application to design. *Prerequisite:* ChE 205, and Junior standing.

ChE 302—Unit Operations Theory II—3 cr. (3 and 0)
A study of selected unit operations based on diffusion. Both stagewise and differential contacts are studied for gas absorption, distillation, and gas-liquid contact operations. *Prerequisite:* ChE 301 and Junior standing.

ChE 306—Unit Operations Laboratory I—1 cr. (0 and 3)
Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is laid on the relation between theory and experimental results and on report writing. *Prerequisite:* ChE 301 and Junior standing.

ChE 307—Analog Computation—1 cr. (0 and 3)
An introduction to the theory and application of electronic analog computers. *Prerequisite:* Math 208.

ChE 331—Chemical Engineering Thermodynamics I—3 cr. (3 and 0)
A first basic course in static equilibria. Topics include the First and Second Law of Thermodynamics, real and ideal gases, thermodynamic properties of fluids, phase changes, and heats of reaction. *Prerequisite:* Ch 331, Math 208, and Junior standing; or permission of the Department Head.

ChE H331—Chemical Engineering Thermodynamics—3 cr. (3 and 0)
Honors section of ChE 301; admission by invitation.

ChE 401—Transport Phenomena—3 cr. (3 and 0)
Heat, mass, and momentum transport with emphasis being laid on how the three processes are related. A firmer theoretical foundation is laid for the previous work in unit operations. *Prerequisite:* ChE 302 and Senior standing.

ChE H401—Transport Phenomena—3 cr. (3 and 0)
Honors section of ChE 401; admission by invitation.

ChE 407—Unit Operations Laboratory II—2 cr. (0 and 6)
Laboratory work for the diffusional unit operations. Competent technical reports are required. *Prerequisite:* Enrollment in ChE 401 and Senior standing.

ChE 410—Unit Operations Theory III—3 cr. (3 and 0)
A study of simultaneous heat and mass transfer, filtration, crystallization, size reduction, and other less common unit operations.

ChE 415—Introduction to Nuclear Engineering—3 cr. (3 and 0)
Designed to acquaint the non-nuclear engineer with some of the engineering aspects of nuclear science. Topics include a brief survey of particle physics; nuclear reactions; energy transformations; nuclear reactors, their design, construction and use; radiation damage to materials of construction; and special problems in nuclear engineering peculiar to the basic engineering disciplines. *Prerequisite:* Junior or Senior standing in Engineering, Chemistry or Physics.

ChE 416—Introduction to Nuclear Engineering—3 cr. (3 and 0)
A continuation of ChE 415; topics to include reactor principles, plutonium production, reactor types, materials of reactor construction, control instruments, and waste disposal. *Prerequisite:* ChE 415.

ChE 421—Process Development, Design, and Optimization of Chemical Engineering Systems I—3 cr. (2 and 3)
A study of the steps in creating a chemical process design from the original concept to successful completion and operation of the plant. Topics include engineering economics, systems analysis, simulation, optimization, process equipment sizing and selection, and the application of analog and digital computers. *Prerequisite:* Completion of all required 200- and 300-level courses in chemistry, chemical engineering, and mathematics.

ChE 422—Process Development, Design, and Optimization of Chemical Engineering Systems II—3 cr. (0 and 9)

A continuation of ChE 421. The principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. *Prerequisite:* ChE 401, 421, 430, and 450.

ChE 424—Introduction to Industrial Pollution—2 cr. (2 and 0)

An introduction to air and water pollution problems associated with chemical processing transportation, and power generation. Basic processes and mechanisms utilized in the control of liquid and gaseous wastes are discussed from a standpoint of equipment design and economics. Present and future trends in pollution legislation are reviewed. *Prerequisite:* Senior standing in chemical engineering, or permission of instructor.

ChE 425—Chemical Process Engineering—3 cr. (3 and 0)

An advanced treatment of chemical engineering unit operations and unit processes. The course is designed to give the undergraduate more depth in these areas. *Prerequisite:* Permission of the instructor.

ChE 430—Chemical Engineering Thermodynamics II—3 cr. (3 and 0)

A continuation of ChE 331. Subjects include heat engines, compressors, refrigeration, phase equilibria and chemical reaction equilibria. *Prerequisite:* ChE 331 and Senior standing.

ChE 440—Senior Inspection Trip—0 cr.

A three- or four-day trip is made to visit selected chemical plants. Using lectures by plant personnel supplemented by conducted tours of chemical plant installations, the student is introduced to current industrial practice. *Prerequisite:* Senior standing in Chemical Engineering.

ChE 450—Chemical Engineering Kinetics—3 cr. (3 and 0)

An introduction to the kinetics of chemical reactions. Topics include homogeneous and heterogeneous reactions, batch and flow reaction systems, catalysis, and design of industrial reactors. *Prerequisite:* ChE 430 or permission of the Department Head.

ChE 452—Molecular and Turbulent Transport—3 cr. (3 and 0)

A theoretical treatment of the fundamental mechanisms of molecular and turbulent heat, mass, and momentum transport with the major emphasis given to the interrelation of all three mechanisms. Evaluation and correlation of transport properties and both steady state and unsteady state processes are considered. An elective course for non-chemical engineering students. *Prerequisite:* Senior standing in Chemistry, Engineering, or Physics, and Math 208.

ChE 453—Process Dynamics—3 cr. (3 and 0)

Basic process control and the effect of feedback in various systems. The mathematical analysis of the dynamic response of process systems to step and sinusoidal changes. Determination of the optimum settings for various combinations of proportional, reset and derivative control. *Prerequisite:* Junior or Senior standing in Engineering, Physics, or Chemistry, and Math 309 or permission of department head.

ChE 491—Special Projects in Chemical Engineering—1-3 cr. (1-3 and 0)

As a need arises, special topics requested by students or offered by the faculty will be taught. Review of current research in an area, technological advances and national engineering goals are possible topic areas.

ChE H491—Special Projects in Chemical Engineering—1-3 cr. (1-3 and 0)

Honors Section of ChE 491; admission by invitation.

ChE 601—Transport Phenomena—3 cr. (3 and 0)

ChE 607—Unit Operations Laboratory II—2 cr. (0 and 6)

ChE 610—Unit Operations Theory III—3 cr. (3 and 0)

ChE 615—Introduction to Nuclear Engineering I—3 cr. (3 and 0)

ChE 616—Introduction to Nuclear Engineering II—3 cr. (3 and 0)

ChE 621—Process Development, Design, and Optimization of Chemical Engineering Systems—3 cr. (2 and 3)

ChE 622—Process Development, Design, and Optimization of Chemical Engineering Systems II—3 cr. (0 and 9)

ChE 625—Chemical Process Engineering—3 cr. (3 and 0)

ChE 630—Chemical Engineering Thermodynamics II—3 cr. (3 and 0)

ChE 650—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 652—Molecular and Turbulent Transport—3 cr. (3 and 0)

ChE 653—Process Dynamics—3 cr. (3 and 0)

ChE 802—Process Dynamics and Control—3 cr. (3 and 0)

ChE 803—Heat, Mass, and Momentum Transfer—3 cr. (3 and 0)

ChE 804—Chemical Engineering Thermodynamics—3 cr. (3 and 0)

ChE 805—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 806—Chemical Engineering Calculations I—3 cr. (3 and 0)

ChE 807—Chemical Engineering Calculations II—3 cr. (3 and 0)

ChE 808—Chemical Engineering Design and Analysis—3 cr. (1 and 6)

ChE 809—Waste Treatment—3 cr. (3 and 0)

ChE 810—Biochemical Engineering—3 cr. (3 and 0)

ChE 820—Fluid Mechanics—3 cr. (3 and 0)

ChE 821—Heat Transport—3 cr. (3 and 0)

ChE 822—Mass Transfer and Differential Contact Operations—3 cr. (3 and 0)

ChE 823—Mass Transfer and Stagewise Contact Operations—3 cr. (3 and 0)

CHE 830—CHEMICAL TECHNOLOGY—3 cr. (3 and 0)

CHE 840—GRADUATE LABORATORY—Credit to be arranged.

CHE 845—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 846—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 847—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 852—AIR POLLUTION CONTROL PROCESSES—3 cr. (3 and 0)

CHE 853—INDUSTRIAL AIR HYGIENE—3 cr. (3 and 0)

CHE 854—ENVIRONMENTAL INSTRUMENTATION AND MEASUREMENTS—3 cr. (2 and 3)

CHE 891—RESEARCH—Credit to be arranged.

CHE 902—PROCESS DYNAMICS AND CONTROL—3 cr. (3 and 0)

CHE 903—TRANSPORT PHENOMENA—3 cr. (3 and 0)

CHE 904—CHEMICAL ENGINEERING THERMODYNAMICS—3 cr. (3 and 0)

CHE 905—CHEMICAL ENGINEERING KINETICS—3 cr. (3 and 0)

CHE 945—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 946—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 947—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 954—ENVIRONMENTAL SYSTEMS DESIGN—3 cr. (3 and 0)

CHE 991—DOCTORAL RESEARCH—Credit to be arranged.

CHEMISTRY

Professors: J. H. HOBSON, J. W. HUFFMAN, F. J. LINDSTROM, A. R. PINDER, H. T. POLK, H. G. SPENCER, *Head*

Associate Professors: J. F. ALLEN, C. B. BISHOP, F. B. BROWN, J. C. FANNING, N. P. MARULLO, J. R. SALLEY, JR., G. B. SAVITSKY, J. L. VON ROSENBERG, JR.

Assistant Professors: J. R. BACON, R. H. BAILEY, JR., A. L. BEYERLEIN, MURIEL B. BISHOP, J. F. GELDARD, O. J. JACOBUS, K. S. LANDERS, G. L. POWELL

CH 101—GENERAL CHEMISTRY—4 cr. (3 and 3)
Gives the student a general knowledge of the fundamentals of the science of chemistry through lectures, lecture experiments, and laboratory exercises. Consideration is given to the common substances.

CH 102—GENERAL CHEMISTRY—4 cr. (3 and 3)
A continuation of Ch 101.

CH H102—GENERAL CHEMISTRY—4 cr. (3 and 3)
Same as Ch 102 except that this honors section is open to students by invitation only.

CH 220—ELEMENTARY ORGANIC CHEMISTRY—4 cr. (3 and 3)
A one semester course in organic chemistry. Typical classes of organic compounds, both aliphatic and aromatic, are studied. *Prerequisite:* Ch 101 and 102.

CH 223—ORGANIC CHEMISTRY—3 cr. (3 and 0)
An introductory course covering the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. *Prerequisite:* Ch 101 and 102.

CH 224—ORGANIC CHEMISTRY—3 cr. (3 and 0)
A continuation of Ch 223.

CH 225—ORGANIC CHEMISTRY LABORATORY—2 cr. (0 and 6)
The laboratory techniques involved in the synthesis, separation and purification, and characterization of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

CH 226—ORGANIC CHEMISTRY LABORATORY—2 cr. (0 and 6)
A continuation of Ch 225. *Prerequisite:* Registration in Ch 224.

CH 227—ORGANIC CHEMISTRY LABORATORY—1 cr. (0 and 3)
The synthesis and properties of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

CH 228—ORGANIC CHEMISTRY LABORATORY—1 cr. (0 and 3)
A continuation of Ch 227. *Prerequisite:* Registration in Ch 224.

CH 310—ELEMENTARY BIOCHEMISTRY—4 cr. (3 and 3)
An introductory course consisting of a review of equilibrium reactions; a study of the chemistry of carbohydrates, proteins, and lipids, and their role in cell metabolism. The laboratory work parallels classroom study. *Prerequisite:* Organic Chemistry.

CH 313—QUANTITATIVE ANALYSIS—3 cr. (3 and 0)
The fundamental principles of volumetric, gravimetric and certain elementary instrumental chemical analyses. *Prerequisite:* Organic Chemistry.

CH 315—QUANTITATIVE ANALYSIS LABORATORY—2 cr. (0 and 6)
The laboratory techniques of volumetric, gravimetric, and elementary instrumental analysis.

CH 317—QUANTITATIVE ANALYSIS LABORATORY—1 cr. (0 and 3)
The standard techniques of analytical chemistry—gravimetric, volumetric, and instrumental.

CH 331—PHYSICAL CHEMISTRY—3 cr. (3 and 0)
Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. *Prerequisite:* Math 206 and Physics.

CH 332—PHYSICAL CHEMISTRY—3 cr. (3 and 0)
Continuation of Ch 331 including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces.

Ch 339—Physical Chemistry Laboratory—1 cr. (0 and 3)
Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. *Prerequisite:* Registration in Ch 331.

Ch 340—Physical Chemistry Laboratory—1 cr. (0 and 3)
A continuation of Ch 339. *Prerequisite:* Registration in Ch 332.

Ch 402—Inorganic Chemistry—3 cr. (3 and 0)
A comprehensive survey of the field of inorganic chemistry through lectures and lecture experiments. Development of modern theories of atomic structure and valence, and a detailed study of the elements and their compounds, based on the periodic system and including both well-known and rarer elements. *Prerequisite:* Ch 331 and 332.

Ch 403—Inorganic Chemistry—3 cr. (3 and 0)
A continuation of Ch 402 with emphasis on the synthesis and properties of inorganic compounds. *Prerequisite:* Ch 402.

Ch 411—Instrumental Analysis—4 cr. (2 and 6)
Demonstration and operation of modern optical and electronic precision measuring devices as they apply to the processes and analytical, physical and organic chemistry. *Prerequisite:* Physical Chemistry.

Ch 421—Advanced Organic Chemistry—3 cr. (3 and 0)
A survey of modern methods of organic synthesis, with an emphasis on the principles involved. Application of spectroscopy in organic chemistry. *Prerequisite:* Ch 224 and 332 or equivalent.

Ch 422—Advanced Organic Chemistry Laboratory—2 cr. (0 and 6)
Modern laboratory techniques are used in the synthesis and identification of organic compounds. *Prerequisite:* Registration in Ch 421.

Ch 428—Organic Spectroscopy—3 cr. (2 and 2)
A survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasis is on interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared and mass spectroscopy, optical rotatory dispersion and circular dicroism. Two hours theory and two hours practical problem solving per week. *Prerequisite:* Organic and Physical Chemistry.

Ch 435—Atomic and Molecular Structure—3 cr. (3 and 0)
An introductory study of the principles of wave mechanics, hydrogen atom structure, approximate methods, molecular orbital and valence bond treatments of bonding, hybridization, ligand-field theory, and relationships of structure to physical and chemical properties.

Ch 436—Physical Chemistry Laboratory—1 cr. (0 and 3)
To be taken in conjunction with Ch 435. Laboratory work in spectroscopy and other related areas of atomic and molecular structure will acquaint the student with some of the instruments currently used in the elucidation of structure.

Ch 441—Glass Manipulation—2 cr. (0 and 6)
A course designed to teach the fundamentals of glass manipulation and its application to the construction and repair of simple laboratory apparatus. *Prerequisite:* Senior standing.

Ch 442—Chemical Literature—1 cr. (1 and 0)

This course is designed to give the student practice in the use of chemical literature, the writing of technical reports and the presentation of same before the faculty of the Department of Chemistry. *Prerequisite:* Junior standing in Chemistry.

Ch 443—Research Problems—3 cr. (0 and 9)

Original investigation of an assigned problem in a fundamental branch of Chemistry. This work must be carried out under the supervision of a member of the staff. *Prerequisite:* Senior standing in Chemistry.

Ch 444—Research Problems—3 cr. (0 and 9)

A continuation of Ch 443.

Ch 450—Review of General Chemistry I—3 cr. (3 and 0)

A lecture course designed to deal with the basic principles generally presented in a general chemistry course. Emphasis will be placed upon the explanation of observed facts in terms of modern atomic and molecular structure. Enrollment limited to secondary school teachers.

Ch 454—Inorganic Synthesis—2 cr. (0 and 6)

A laboratory course designed to acquaint the student with various methods and techniques employed in the preparation and handling of inorganic compounds.

Ch 472—Organic Synthesis—4 cr. (2 and 6)

A course designed to teach the student techniques and principles as applied in a research laboratory. Both macro and semi-macro methods are used in the preparation of several organic compounds. *Prerequisite:* Organic Chemistry.

Ch 491—Introduction to Radiochemistry—3 cr. (2 and 3)

The natural and synthetic radioisotopes, including the consideration of atomic and nuclear structure, properties of radiation and tracer techniques and their application. The laboratory is concerned with the methods of detection and measurement of the various types of radiation and the various applications of tracer techniques. *Prerequisite:* Senior or Graduate standing and permission of instructor.

Ch 602—Inorganic Chemistry—3 cr. (3 and 0)

Ch 603—Inorganic Chemistry—3 cr. (3 and 0)

Ch 611—Instrumental Analysis—4 cr. (2 and 6)

Ch 613—Quantitative Analysis—3 cr. (3 and 0)

Ch 615—Quantitative Analysis Laboratory—2 cr. (0 and 6)

Ch 617—Quantitative Analysis Laboratory—1 cr. (0 and 3)

Ch 621—Advanced Organic Chemistry—3 cr. (3 and 0)

Ch 622—Advanced Organic Chemistry Laboratory—2 cr. (0 and 6)

Ch 628—Organic Spectroscopy—3 cr. (2 and 2)

Ch 631—Physical Chemistry—3 cr. (3 and 0)

Ch 632—Physical Chemistry—3 cr. (3 and 0)

Ch 635—Atomic and Molecular Structure—3 cr. (3 and 0)

Ch 636—Physical Chemistry Laboratory—1 cr. (0 and 3)

Ch 639—Physical Chemistry Laboratory—1 cr. (0 and 3)

Ch 640—Physical Chemistry Laboratory—1 cr. (0 and 3)

Ch 650—Review of General Chemistry I—3 cr. (3 and 0)

Ch 654—Inorganic Synthesis—2 cr. (0 and 6)

Ch 672—Organic Synthesis—4 cr. (2 and 6)

Ch 691—Introduction to Radiochemistry—3 cr. (2 and 3)

Ch 800T—Physical Science for the High School Teachers—3 cr. (3 and 0)

Ch 805—Theoretical Inorganic Chemistry—3 cr. (3 and 0)

Ch 806—Special Topics in Inorganic Chemistry—1 to 4 cr.

Ch 807—Chemistry of the Transition Elements—3 cr. (3 and 0)

Ch 808—Chemistry of the Non-Metallic Elements—3 cr. (3 and 0)

Ch 811—Analytical Chemistry—3 cr. (3 and 0)

Ch 812—Chemical Spectroscopic Methods—3 cr. (2 and 3)

Ch 814—Electroanalytical Chemistry—3 cr. (2 and 3)

Ch 821—Organic Chemistry I—3 cr. (3 and 0)

Ch 822—Organic Chemistry II—3 cr. (3 and 0)

Ch 823—Organic Reaction Mechanisms—3 cr. (3 and 0)

Ch 824—Fundamental Principles of Polymer Chemistry—3 cr. (3 and 0)

Ch 825—Current Topics in Organic Chemistry—1 cr. (1 and 0)

Ch 831—Chemical Thermodynamics—3 cr. (3 and 0)

Ch 834—Statistical Thermodynamics—3 cr. (3 and 0)

Ch 835—Chemical Kinetics—3 cr. (3 and 0)

Ch 837—Quantum Chemistry—3 cr. (3 and 0)

Ch 850—A Review of General Chemistry II—3 cr. (2 and 3)

Ch 851—Seminar—0,1 or 2 cr.

Ch 861—Principles of Biochemistry—3 cr. (3 and 0)

Ch 891—Research—Credit to be arranged.

Ch 920—Advanced Topics in Organic Chemistry—1-4 cr. (1-4 and 0)

Ch 930—Advanced Topics in Physical Chemistry—1-4 cr. (1-4 and 0)

Ch 950—Microanalytical Techniques—3 cr. (1 and 6)

Ch 991—Doctoral Research—Credit to be arranged.

CITY AND REGIONAL PLANNING

Professors: E. L. Falk, V. S. Hodges

Associate Professor: E. Pinckney

Assistant Professor: K. E. Carpenter

Lecturer: S. Carter

Visiting Associate Professor: R. D. Bray

CRP 411—Introduction to City and Regional Planning—3 cr. (3 and 0)
Overview of urban land-use planning. Analysis of current work in each significant phase of planning. Discussion of goal formulation, foundation studies, land-use planning methods and considerations, and continuing evaluation and modification of an urban-planning process.

CRP 412—City and Regional Planning Theory—3 cr. (3 and 0)
The philosophical, methodological, and ethical aspects of planning will be explored through selected readings, student reports, lectures and discussion. A critical examination of current planning theories.

CRP 421—Urban Social Structure—3 cr. (3 and 0)
The social, economic, and political aspects of communities of varying sizes and types. Elements will include housing, education, recreation, social services, governmental structure, and related community institutions.

CRP 441—History of Planning—3 cr. (3 and 0)
The development of the urban plan from ancient to modern times.

CRP 453—Introduction to Planning Studio—5 cr. (4 and 12)
New town site selection, preparation of goals and objectives, foundation studies and forecasts, and development of generalized land use and transportation plan. Students will gain experience in project coordination and interdepartmental and governmental agency cooperation.

CRP 454—Planning Studio II—5 cr. (4 and 12)
Studies involving small or medium-sized cities. These will include evaluation of community goals and objectives, appropriate foundation surveys and projections, and development of generalized land-use alternatives. Work with available land-use data, professionals involved in the planning function, and development of a generalized land-use plan, reflective and responsive to community and official needs.

CRP 472—Planning Administration and Practice—3 cr. (3 and 0)
The organization and administration of types of planning agencies and their relationship to other governmental and private organizations.

CRP 473—Government and Planning Law—3 cr. (3 and 0)
A complete coverage of the laws and ordinances relating to redevelopment, subdivision control, zoning, official mapping, and other topics including interpretation, philosophy, enabling legislation, and model ordinances. The legal basis of current and long-range planning policy will be discussed. *Prerequisite:* CRP 472 (Planning Administration and Practice).

CRP 483—Seminar on Planning Communication—3 cr. (3 and 0)
Informal means open for plan implementation. The organization of effective public information and education programs, use of citizens' advisory com-

mittees, and application of other implementation techniques. Lectures, student reports, selected readings, and visiting speakers.

CRP 611—Introduction to City and Regional Planning—3 cr. (3 and 0)

CRP 612—City and Regional Planning Theory—3 cr. (3 and 0)

CRP 621—Urban Social Structure—3 cr. (3 and 0)

CRP 641—History of Planning—3 cr. (3 and 0)

CRP 653—Introduction to Planning Studio—5 cr. (4 and 12)

CRP 654—Planning Studio II—5 cr. (4 and 12)

CRP 672—Planning Administration and Practice—3 cr. (3 and 0)

CRP 673—Government and Planning Law—3 cr. (3 and 0)

CRP 683—Seminar on Planning Communication—3 cr. (3 and 0)

CRP 822—Urban Systems—3 cr. (3 and 0)

CRP 831—Economics of Land Use Planning—3 cr. (3 and 0)

CRP 863—Planning Studio III—5 cr. (2 and 9)

CRP 864—Planning Thesis—9 cr. (0 and 27)

CRP 881—Seminar in Quantitative Methods I—3 cr. (3 and 0)

CRP 882—Seminar in Quantitative Methods II—3 cr. (3 and 0)

CRP 884—Public Facility Planning—3 cr. (3 and 0)

CRP 893—City and Regional Planning Internship—3 cr. (0 and 0)

CRP 894—City and Regional Planning Internship—3 cr. (0 and 0)

CIVIL ENGINEERING

Professor: I. A. Trively

Associate Professors: W. Baron, H. W. Busching, *Head;* J. E. Clark, R. E. Elling, J. M. Ford, J. C. McCormac, J. P. Rostron, A. E. Schwartz

Assistant Professors: B. L. Edge, F. L. Roberts, D. B. Stafford, W. A. Welsh, Jr.

CE 201—Surveying—3 cr. (2 and 3)

Elementary plane surveying for other than Civil Engineering students. Coverage includes measurement of distance, leveling, horizontal and vertical angles, stadia and topography, area and volume calculations, construction surveying. Field exercises provide practice in the use of surveying instruments. *Prerequisite:* Math 106.

CE 205—Civil Engineering Methodology—2 cr. (1 and 3)

Concepts of civil engineering analysis and design, case histories and project studies, introduction to theory and practice of plane surveying, measurements and errors, differential leveling, and topographic mapping. Laboratory includes typical design and construction problems. *Prerequisite:* Math 106.

CE 206—Geometrics—2 cr. (1 and 3)

Application of geometrics to civil engineering problems, computations and triangulation, coordinate systems, electronic methods of measuring distances, photogrammetry, introduction to digital computation and elementary programming. *Prerequisite:* CE 205.

CE 301—Introduction to Structural Science—3 cr. (2 and 2)
Analysis of statically determinate and indeterminate structural elements and systems. Influence lines for beams and trusses, calculation of rotations and deflections by integration, moment area, conjugate beam and unit load methods. Indeterminate analysis by force and displacement methods and moment distribution. *Prerequisite:* EM 304, CE 206.

CE 302—Structural Design I—3 cr. (2 and 2)
Design and detail of components and connections for timber and metal structures. *Prerequisite:* CE 301.

CE 310—Transportation Engineering—4 cr. (3 and 2)
Planning, location, design, operation, and administration of highways, railroads, airports and other transportation facilities, including economic considerations, pavement design, and digital computer applications to geometric and earthwork computation. *Prerequisite:* CE 206; *corequisite:* CE 331.

CE 320—Concrete and Bituminous Materials—2 cr. (1 and 3)
Investigation and selection of aggregates for portland cement concrete and asphaltic concrete; latest methods of design of portland cement mixes and asphaltic concrete mixes; field control and adjustments; field trips to nearby construction jobs. *Prerequisite:* EM 304 and Junior standing.

CE 330—Soil Mechanics—3 cr. (2 and 2)
Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength, consolidation, stress distribution and bearing capacity of soils. *Prerequisite:* EM 304 and Junior standing.

CE 341—Environmental Engineering—3 cr. (3 and 0)
An evaluation of the effects of the environment on man with special consideration given to air and water contacts. The analysis and review of engineering systems used in environmental control. *Prerequisite or Concurrent:* EM 320, EM 322.

CE 399—Simulation Techniques—1 cr. (0 and 3)
Modeling of civil engineering problems with the electronic analog computer, with conductive sheet methods and by digest analog simulation. The emphasis is in use rather than the theory of the methods. *Prerequisite:* Math 208.

CE 402—Structural Design II—3 cr. (2 and 2)
Design and detail of reinforced concrete members using elastic and ultimate strength theories, introduction to prestressed concrete. *Prerequisite:* CE 301, CE 320.

CE 410—Traffic Engineering: Operations—3 cr. (3 and 0)
Basic characteristics of motor-vehicle traffic; techniques for making traffic engineering investigations; design and application of traffic control devices; traffic design of parking facilities; traffic laws and ordinances; public relations. *Prerequisite:* CE 310.

CE 412—Urban Transportation Planning—3 cr. (3 and 0) F
Urban travel characteristics; characteristics of transportation systems; transportation and land-use studies; trip distribution and trip assignment models; city patterns and subdivision layout. *Prerequisite:* CE 311.

CE 415—Seminar in Traffic Engineering—1 cr. (0 and 2)
Discussion, readings, and practical applications of the operational methods of traffic engineering and consideration of the problems confronting the city, county, and state traffic engineer.

CE 417—Airphoto Interpretation I—3 cr. (2 and 3)
A brief review of the basic geometry of aerial photographs, characteristics of geologic and topographic features identifiable from aerial photographs, and site characteristics related to soil profile. Laboratory work includes soil mapping, selection of construction sites, and location of soil deposits for engineering purposes. *Prerequisite:* Junior standing and/or permission of instructor.

CE 419—General Photogrammetry—3 cr. (2 and 3) S
Fundamentals of mapping by the use of aerial photographs; characteristics, production and use of aerial photographs; study of the operation of popular photogrammetric instruments including aerial cameras, stereoscopic viewing and plotting equipment; practice in the use of stereocomparagraph and multiplex plotting instruments; scale, tilt, and coordinate calculations; construction of photomosaics. *Prerequisite:* Math 108 and Junior standing.

CE 420—Mechanical Properties of Materials—3 cr. (3 and 0)
The course provides a comprehensive introduction to the analysis of mechanical response of materials. Emphasis is placed on the behavior of solid materials that are used in civil engineering structures but are not considered in depth in other undergraduate courses. Plastics, fibers, and composite materials are studied. Students are assisted in investigating a realistic problem in materials technology. *Prerequisite:* Permission of instructor.

CE 424—Construction Methods—2 cr. (2 and 0)
A survey of the principal method and equipment used in the construction industry. *Prerequisite:* Senior standing.

CE 425—Engineering Relations—3 cr. (3 and 0)
Business, legal, and ethical relations in engineering practice. *Prerequisite:* Senior standing.

CE 431—Applied Soil Mechanics—3 cr. (2 and 2)
Relationship of local geology to soil formations, ground water, planning of site investigation, sampling procedures, laboratory determination of design parameter, foundation design and settlement analysis. *Prerequisite:* CE 331.

CE 434—Construction Costs and Estimates—3 cr. (2 and 2)
Interpretation of specifications and plan reading necessary for the proper estimation of quantities of materials and costs of engineering structures. The course is presented from both the designer's and the constructor's viewpoint in order to fit the young engineer with the essential details an inspector or a construction engineer should have at his command. *Prerequisite:* Senior standing.

CE 435—Engineering Project Analysis—3 cr. (2 and 2)
Advanced analysis of engineering projects. Theory of economic, financial and intangible analysis of large-scale construction projects. Practical exercises in cost-benefit studies and construction decisions. *Prerequisite:* Permission of instructor.

CE 441—Water Resources Engineering—3 cr. (2 and 3)
The hydrologic and economic considerations involved in the control and utilization of water; analysis and design of water and waste water collection systems and water distribution systems. *Prerequisite:* CE 341, EM 320, and EM 322.

CE 453—Advanced Structural Analysis—3 cr. (3 and 0)
Slopes and deflections of beams and trusses by energy methods. Analysis of statically indeterminate structures and construction of influence lines by virtual-work method. Application of moment distribution and slope deflection methods. *Prerequisite:* CE 301.

CE 462—Port and Harbor Engineering—3 cr. (3 and 0)
A unified treatment of the basic principles used in the design, construction, and operation of ports and harbors. Emphasis is placed on the philosophy behind port layout and the optimal site and size selections, as well as optimal port operations. The basic principles and economic factors in small craft harbor design are studied. The requirements for harbor maintenance and the design of harbor protection structures are presented. This integrated treatment covers in varying degrees the application of soil, structure, and fluid mechanics as well as some economic optimizing criteria.

CE 490—Special Projects—1-3 cr. (1-3 and 0-0)
Studies or laboratory investigations on special topics in the Civil Engineering field which are of interest to individual students and staff members. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. *Prerequisite:* Senior standing.

CE H490—Special Projects—1-3 cr. (1-3 and 0)
Honors section of CE 490; admission by invitation.
(Non-Civil Engineering students only.)

CE 610—Traffic Engineering: Operations—3 cr. (3 and 0)

CE 612—Urban Transportation Planning—3 cr. (3 and 0)

CE 615—Seminar in Traffic Engineering—1 cr. (0 and 2)

CE 617—Airphoto Interpretation I—3 cr. (2 and 3)

CE 619—General Photogrammetry—3 cr. (2 and 3)

CE 620—Mechanical Properties of Materials—3 cr. (3 and 0)

CE 630—Soil Mechanics—3 cr. (2 and 2)

CE 631—Applied Soil Mechanics—3 cr. (2 and 2)

CE 634—Construction Costs and Estimates—3 cr. (2 and 3)

CE 635—Engineering Project Analysis—3 cr. (2 and 2)

CE 653—Advanced Structural Analysis—3 cr. (3 and 0)

CE 662—Port and Harbor Engineering—3 cr. (3 and 0)

CE 699—SIMULATION TECHNIQUES—1 cr. (0 and 3)

CE 801—STRUCTURAL ENGINEERING I—3 cr. (3 and 0)

CE 802—PRESTRESSED CONCRETE ANALYSIS AND DESIGN—3 cr. (3 and 0)

CE 803—REINFORCED CONCRETE STRUCTURAL SYSTEMS—3 cr. (3 and 0)

CE 804—THEORY AND DESIGN OF THIN PLATES—3 cr. (3 and 0)

CE 805—PLASTIC DESIGN OF STEEL STRUCTURES—3 cr. (3 and 0)

CE 806—DESIGN OF STEEL MEMBERS—3 cr. (3 and 0)

CE 807—NUMERICAL AND APPROXIMATE METHODS OF STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 808—FINITE ELEMENT METHODS IN STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 811—HIGHWAY GEOMETRIC DESIGN—3 cr. (2 and 3)

CE 812—AIRPHOTO INTERPRETATION II—3 cr. (2 and 3)

CE 813—HIGHWAY AND AIRPORT PAVEMENT DESIGN—3 cr. (3 and 0)

CE 814—TRAFFIC FLOW THEORY—3 cr. (3 and 0)

CE 815—HIGHWAY SAFETY ENGINEERING—3 cr. (3 and 0)

CE 816—HIGHWAY PLANNING—3 cr. (3 and 0)

CE 818—AIRPORT PLANNING AND DESIGN—3 cr. (3 and 0)

CE 819—TRANSPORTATION RESEARCH—2 to 4 cr.

CE 820—CEMENT AND CONCRETE—3 cr. (2 and 3)

CE 821—BITUMINOUS PAVING MATERIALS—3 cr. (2 and 3)

CE 822—AGGREGATES AS CONSTRUCTION MATERIALS—3 cr. (2 and 3)

CE 823—INELASTIC BEHAVIOR OF ENGINEERING MATERIALS—3 cr. (3 and 0)

CE 825—DISTRIBUTION AND PROPERTIES OF SOILS—3 cr. (3 and 0)

CE 831—FOUNDATION ENGINEERING—3 cr. (2 and 3)

CE 832—ADVANCED SOIL MECHANICS—3 cr. (3 and 0)

CE 833—PHYSICAL AND PHYSIO-CHEMICAL PROPERTIES OF SOILS—3 cr. (2 and 3)

CE 835—DESIGN OF EARTH STRUCTURES—3 cr. (3 and 0)

CE 889—SPECIAL PROBLEMS I—1-3 cr.

CE 890—SPECIAL PROBLEMS II—1-3 cr.

CE 891—RESEARCH—3 cr.

CE 901—THEORY AND DESIGN OF SHELLS—3 cr. (3 and 0)

CE 902—STRUCTURAL VIBRATIONS—3 cr. (3 and 0)

CE 991—DOCTORAL RESEARCH—Credit to be arranged.

COMPUTING SCIENCE

(Administered by the Department of Mathematics)

Professors: A. T. HIND, JR., J. W. KENELLY
Associate Professors: R. E. HAYMOND, C. E. KIRKWOOD, JR., M. C. PALMER
Assistant Professors: W. R. BOLAND, P. C. BOWIE
Instructor: EUGENIE V. BARTMESS

COMP SC 205—ELEMENTARY COMPUTER PROGRAMMING—3 cr. (3 and 0)
A detailed study of an algebraic computer programming language and its use in solving problems. The language will be selected as appropriate to the computer presently available.

COMP SC 206—ADVANCED PROGRAMMING IN FORTRAN—3 cr. (3 and 0)
A continuing study of computer programming with the Fortran language. Emphasis on subroutine computation with application to problems in science and engineering. *Prerequisite:* Comp Sc 205.

COMP SC 207—ADVANCED PROGRAMMING IN PL/1—3 cr. (3 and 0)
A programming course utilizing the advanced features of the PL/1 language. Topics include dynamic storage allocation, string manipulation, compile-time facilities, error handling, and list processing. *Prerequisite:* Comp Sc 205.

COMP SC 210—ALGORITHMIC PROCESSES FOR ENGINEERS—3 cr. (3 and 0)
Concept and properties of an algorithm, language and notations for describing algorithms, analysis of computational problems, development of algorithms, and applications to include polynomial interpolation, zeros of equations, systems of equations, matrix manipulations, and solution of differential equations.

COMP SC 308—DATA PROCESSING FOR BUSINESS APPLICATIONS—3 cr. (3 and 0)
An introduction to the Cobol language with application to business data processing. Emphasis is placed on the organization and processing of data files. *Prerequisite:* Comp Sc 205.

COMP SC 311—COMPUTER ORGANIZATION AND PROGRAMMING—3 cr. (3 and 0)
Logical basis of computer structure, machine representation of numbers and characters, flow of control, instruction codes, arithmetic and logical operations, indexing, input-output, subroutines, linkages, macros, interpretive and assembly systems, storage organization. *Prerequisite:* Comp Sc 205.

COMP SC 313—INTRODUCTION TO SYSTEMS PROGRAMMING—3 cr. (3 and 0)
Advanced assembler language techniques, macros, job control language, linkage of assembler language routines with higher level languages, debugging techniques, utilities. Programs are written by the student to make use of the above topics. *Prerequisite:* Comp Sc 311.

COMP SC 409—INTRODUCTION TO NUMERICAL ANALYSIS I—3 cr. (3 and 0)
An introduction to the problems of classical numerical analysis emphasizing computational procedures and application. Topics include: polynomial interpolation, matrix methods, systems of linear equations, nonlinear equations, numerical solution of ordinary differential equations. *Prerequisite:* Comp Sc 205 or EE 299 and Math 208.

COMP SC 410—INTRODUCTION TO NUMERICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Comp Sc 409. Ordinary differential equations boundary value problems, functional approximation, numerical solution of partial differential equations.

Comp Sc 428—Algorithmic Languages and Compilers—3 cr. (3 and 0)
Formed description of algorithmic languages and the techniques used in their compilation, study of syntax, semantics, procedures, replication, iteration, and recursion in these languages, including comparisons of commonly used languages. *Prerequisite:* Comp Sc 205, Math 295 or equivalent.

Comp Sc 609—Introduction to Numerical Analysis I—3 cr. (3 and 0)

Comp Sc 610—Introduction to Numerical Analysis II—3 cr. (3 and 0)

Comp Sc 611—Computer Organization and Programming—3 cr. (3 and 0)

Comp Sc 628—Algorithmic Languages and Compilers—3 cr. (3 and 0)

Comp Sc 863—Digital Models I—3 cr. (3 and 0)

Comp Sc 864—Digital Models II—3 cr. (3 and 0)

DAIRY SCIENCE

Professors: R. W. Henningson, V. Hurst, J. J. Janzen, W. A. King, *Head;* J. T. Lazar, Jr.

Associate Professors: C. C. Brannon, W. V. Chalupa, J. F. Dickey

Assistant Professor: G. D. O'Dell

Dy Sc 201—Introduction to Dairy Science—3 cr. (2 and 3) F, S
A fundamental course designed to give the student a working knowledge of Dairy Science. Studies include history of dairying, dairy breeds and cattle evaluation, nutrition, physiology, housing, quality milk production, quality control and the evaluation of milk and its products, the manufacture of milk products and their value in the human food supply.

Dy Sc 306—The Chemical and Physical Nature of Milk—3 cr. (2 and 3) S
The nature and properties of the major and minor constituents of milk, the effect of chemical and physical treatment on milk constituents, and analytical methods necessary to determine the composition and properties of milk and its constituents. The philosophy and development of quality control.

Dy Sc 307—Market Milk—3 cr. (2 and 3) F, '72 and alternate years.
Composition, procurement, processing, distribution, quality control, public health aspects, basic chemistry and bacteriology of industrial milk supplies and cultured products.

Dy Sc 310—Dairy Cattle Selection—1 cr. (0 and 3) F, '72 and alternate years.
Emphasis is placed upon the selection of dairy cattle for profitable herd operations. Evaluations of herd classifications, fitting, showing, and true type are made.

Dy Sc 402—Dairy Manufactures—4 cr. (3 and 3) S, '72 and alternate years.
The principles and practice of the manufacture of ice cream and related dairy products, the principles of the manufacturer of condensed and evaporated milks and milk powders, and the physical, chemical and biological factors involved.

DY SC 404—PLANT MANAGEMENT—3 cr. (2 and 3)
S, '73 and alternate years.

The organization and operation of dairy and food plants and the coordination of all functions into an orderly business enterprise. Emphasis will be given to management's responsibility concerning the procurement, processing, quality control and distribution of food products. Business and industrial techniques are used to develop maximum efficiencies.

DY SC 409—DAIRY SCIENCE SEMINAR—2 cr. (2 and 0)
F, '71 and alternate years.

Special research problems in production and manufactures are studied. Individual topics not fully covered in class work are assigned for special report before class and members of Dairy Science Staff.

DY SC 410—DAIRY SCIENCE SEMINAR—2 cr. (2 and 0)
S, '72 and alternate years.

A continuation of Dy Sc 409 with emphasis on current research literature and research methods.

DY SC 452—DAIRY CATTLE FEEDING AND MANAGEMENT—3 cr. (2 and 3)
S, '73 and alternate years.

Fundamental principles in the care, feeding, and management of dairy cattle of all ages. Topics include general consideration in selecting a breed and the individual cow, calf raising, growth and development of dairy heifers, care and management of the milking herd and feeding for milk production.

DY SC 453—ANIMAL REPRODUCTION—3 cr. (3 and 0) F

Reproductive physiology and endocrinology of mammals with emphasis on farm animals and frequent reference to reproduction in laboratory animals and humans.

DY SC 455—ANIMAL REPRODUCTION LABORATORY—1 cr. (0 and 3) F

This course will supplement Dy Sc 453. Practical work will include comparative anatomy and histology of the male and female reproductive organs; semen collection, evaluation and processing; techniques of artificial insemmination, sexual behavior and the principles of pregnancy tests for humans. *Prerequisite:* To be taken concurrently or to follow Dy Sc 453.

DY SC 602—DAIRY MANUFACTURES—4 cr. (3 and 3)

DY SC 604—PLANT MANAGEMENT—3 cr. (2 and 3)

DY SC 606—CHEMICAL AND PHYSICAL NATURE OF MILK—3 cr. (2 and 3)

DY SC 607—MARKET MILK—3 cr. (2 and 3)

DY SC 652—DAIRY CATTLE FEEDING AND MANAGEMENT—3 cr. (2 and 3)

DY SC 653—ANIMAL REPRODUCTION—3 cr. (3 and 0)

DY SC 655—ANIMAL REPRODUCTION LABORATORY—1 cr. (0 and 3)

DY SC 801—TOPICAL PROBLEMS—1 to 3 cr.

DY SC 802—GENETICS OF DAIRY CATTLE IMPROVEMENT—3 cr. (3 and 0)

DY SC 803—PHYSIOLOGY OF REPRODUCTION AND MILK SECRETION—3 cr. (3 and 0)

DY SC 804—ENDOCRINOLOGY—3 cr. (3 and 0)

Dy Sc 805—Newer Knowledge of Dairy Nutrition—3 cr. (3 and 0)

Dy Sc 807—Fermented Dairy Products—3 cr. (2 and 3)

Dy Sc 808—Industrial Dairy Science—3 cr. (3 and 0)

Dy Sc 891—Research—Credit to be arranged.

ECONOMICS

Professors: H. H. Macaulay, Jr., W. C. Whitten, Jr.

Associate Professor: B. R. Skelton

Assistant Professors: F. A. Close, *Head;* R. F. Hebert, R. D. Shannon, H. H. Ulbrich,* T. B. Yandle, Jr., J. A. Ziegler, P. M. Zipin

Instructors: L. E. Nordquist, W. D. Plylar, A. G. Wise

Econ 201—Principles of Economics—3 cr. (3 and 0)

The fundamental principles of pricing, stablization and growth in a modern economy. Topics include supply and demand, employment theory and fiscal policy, the banking system and monetary policy, and the economics of growth.

Econ H201—Principles of Economics—3 cr. (3 and 0)

An enrichment of the subject matter of Econ 201 through assigned readings and individualized instruction; admission by invitation.

Econ 202—Principles of Economics—3 cr. (3 and 0)

Continuation of Econ 201 with an intensive study of the economics of the firm, the pricing of resources, and international economic relations. The theory is given relevance through the analysis of current economic problems. *Prerequisite:* Econ 201.

Econ H202—Principles of Economics—3 cr. (3 and 0)

An enrichment of the subject matter of Econ 202 through assigned readings and individualized instruction; admission by invitation. *Prerequisite:* Econ 201 or Econ H201.

Econ 301—Economics of Labor—3 cr. (3 and 0)

The economics of the labor market, the problems of the industrial worker, and the methods of adjusting labor-management disputes. *Prerequisite:* Econ 201.

Econ 302—Money and Banking—3 cr. (3 and 0)

Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. *Prerequisite:* Econ 201 and 202.

Econ 305—Investment Analysis—3 cr. (3 and 0)

A study of techniques useful in analyzing alternative investment opportunities, with emphasis on corporate securities. Investment planning and portfolio management are considered. *Prerequisite:* Econ 201.

Econ 306—Risk and Insurance—3 cr. (3 and 0)

Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints by considering insurance carriers, contracts, underwriting and regulation. *Prerequisite:* Econ 201.

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* Part-time.

ECON 308—COLLECTIVE BARGAINING—3 cr. (3 and 0)
The practices, procedures, legal foundations, and legal structure associated with collective bargaining. The form and content of the labor contract, the grievance machinery, and the mediation and arbitration institutions will also be studied. *Prerequisite:* Econ 201.

ECON 309—GOVERNMENT AND BUSINESS—3 cr. (3 and 0)
The relationships between government and business, including among other topics, governmental efforts to enforce competition, to regulate public utilities, and to protect the special interests of laborers, farmers, and consumers. *Prerequisite:* Econ 201.

ECON 314—INTERMEDIATE ECONOMIC THEORY—3 cr. (3 and 0)
An analytical study of the basic concepts of value and distribution under alternative market conditions. *Prerequisite:* Econ 201 and 202.

ECON 350T—ECONOMICS OF THE CONSUMER AND THE FIRM IN A MARKET SYSTEM—3 cr. (3 and 0)
Scarce resources impose the necessity of choice on society; the rationale of the market system in the allocation of these scarce resources, basic market theory and its application to contemporary economic problems in American society; the solutions of a non-market system will be contrasted. Open only to public school teachers of social studies.

ECON 351T—ECONOMICS OF EMPLOYMENT, THE PRICE LEVEL, AND GROWTH—3 cr. (3 and 0)
National income accounting concepts will be studied; also money and banking, monetary policy, fiscal policy, and an analysis of their relationship to national income, employment, the price level, and economic growth. Open only to public school teachers of social studies.

ECON 403—DEVELOPMENT OF ECONOMIC THOUGHT—3 cr. (3 and 0)
A study of the origin and evolution of ideas with some emphasis on the historical context, the problems which inspired these ideas, and the nature of the solutions which they provided: from ancient days to the present. *Prerequisite:* Econ 201 and 202.

ECON 404—COMPARATIVE ECONOMIC SYSTEMS—3 cr. (3 and 0)
A comparative analytical and historical study of the principal economic systems which have been important in the modern world including among others, capitalism and socialism. *Prerequisite:* Econ 201 and 202.

ECON 407—NATIONAL INCOME AND EMPLOYMENT ANALYSIS—3 cr. (3 and 0)
An intensive study of selected economic theories with special emphasis on income and employment. Part of the course is devoted to the analysis of national income accounts and income. *Prerequisite:* Econ 201 and 202.

ECON 410—ECONOMIC DEVELOPMENT—3 cr. (3 and 0)
Consideration and analysis of economic and related problems of the underdeveloped countries. Attention will be given to national and international programs designed to accelerate solution of these problems. *Prerequisite:* Econ 201 and 202.

ECON 412—INTERNATIONAL TRADE—3 cr. (3 and 0)
A study of economic principles particularly applicable to trade between nations. Topics covered include the balance of payments, determination of

foreign exchange rates, price and income effects on the composition and level of trade, and commercial policy. *Prerequisite:* Econ 314.

ECON 413—INTERNATIONAL FINANCE—3 cr. (3 and 0)
With primary emphasis upon international monetary relations, the course surveys history and theory. Topics covered include exchange-rate determination, exchange-stability conditions, the purchasing-power-parity doctrine, the effects of devaluation and exchanging speculation. (Not open to students who have taken Econ 412.) *Prerequisite:* Econ 302.

ECON 416—DEVELOPMENT OF THE MODERN ECONOMY—3 cr. (3 and 0)
An analysis of the historical forces and influences which have contributed to the emergence and development of the modern economy. *Prerequisite:* Econ 201 and 202.

ECON 419—ECONOMICS OF DEFENSE—3 cr. (3 and 0)
Examines the American defense establishment in terms of resources utilized, the alternative uses of these resources and the contribution to the national economy and scientific progress that is generated by these resources in a defense use. Particular attention is given to economic problems inherent in shifting resources from non-defense to defense uses and vice versa as well as among alternative defense uses. *Prerequisite:* Acct 201 and Econ 201.

ECON 420—ECONOMICS OF TAXATION—3 cr. (3 and 0)
An intensive study of a limited number of problems in taxation with particular emphasis on the economic effects that cause and result from certain taxes. Topics include averaging, incentives to work, incidence, concepts of equity, excess burden, definitions of income, depletion, and capital gains. *Prerequisite:* Econ 314.

ECON 421—URBAN ECONOMICS—3 cr. (3 and 0)
Economic problems associated with the concentration of population in central places are examined. The historical development of cities and the associated economic implications for individuals, firms, and society are studied. Legislation of economic importance to urban living is analyzed. *Prerequisite:* Econ 201 and 202.

ECON 422—MONETARY THEORY AND POLICY—3 cr. (3 and 0)
An intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. *Prerequisite:* Econ 302 or permission of the instructor.

ECON 424—THE ORGANIZATION OF INDUSTRIES—3 cr. (3 and 0)
Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output and other policies of the firm; antitrust and other public policies and problems will be studied. *Prerequisite:* Econ 314.

ECON 603—DEVELOPMENT OF ECONOMIC THOUGHT—3 cr. (3 and 0)

ECON 604—COMPARATIVE ECONOMIC SYSTEMS—3 cr. (3 and 0)

ECON 607—NATIONAL INCOME AND EMPLOYMENT ANALYSIS—3 cr. (3 and 0)

ECON 610—ECONOMIC DEVELOPMENT—3 cr. (3 and 0)

ECON 612—INTERNATIONAL TRADE—3 cr. (3 and 0)

Econ 613—International Finance—3 cr. (3 and 0)

Econ 616—Development of the Modern Economy—3 cr. (3 and 0)

Econ 619—Economics of Defense—3 cr. (3 and 0)

Econ 620—Economics of Taxation—3 cr. (3 and 0)

Econ 621—Urban Economics—3 cr. (3 and 0)

Econ 622—Monetary Theory and Policy—3 cr. (3 and 0)

Econ 624—The Organization of Industries—3 cr. (3 and 0)

Econ 650T—Economics of the Consumer and the Firm in a Market System—3 cr. (3 and 0)

Econ 651T—Economics of Employment, the Price Level, and Growth—3 cr. (3 and 0)

Econ 800—Advanced Economic Analysis—3 cr. (3 and 0)

Econ 802—Advanced Economic Concepts and Applications I—3 cr. (3 and 0)

Econ 803—Advanced Economic Concepts and Applications II—3 cr. (3 and 0)

Econ 810—Seminar in Economic Methodology—3 cr. (3 and 0)

Econ 811—Seminar in Labor Economics—3 cr. (3 and 0)

Econ 812—Seminar in the Development of Economic Thought—3 cr. (3 and 0)

Econ 813—Seminar in Community Goods and Environmental Quality—3 cr. (3 and 0)

Econ 820—Seminar in the Economics of Taxation—3 cr. (3 and 0)

Econ 821—Economic Theory I—3 cr. (3 and 0)

Econ 822—Economic Theory II—3 cr. (3 and 0)

Econ 891—Research—Credit to be arranged.

Econ 900—Seminar in Advanced Economic Theory—3 cr. (3 and 0)

EDUCATION

Professors: L. H. Davis, C. R. Freeze, M. A. King, *Head;* H. F. Landrith

Associate Professors: G. W. Gray, M. A. Packer, W. W. Pennscott, R. E. Ware

Assistant Professors: S. L. Buckner, J. R. Harris, J. A. Hash, Jean L. Hice, T. H. Parry

Instructor: Elizabeth B. Galloway

Lecturer: Teryle W. Carpenter

Ed 011—Basic Reading—5 cr. (5 and 0)

Designed for students who have not acquired adequate reading skills as demonstrated by scores on entrance examinations or diagnostic tests. Study skills, vocabulary, content reading and diagnosis of students' problems, including counseling for vocational and academic potential. Course meets five hours per week.

Ed 013—Basic Reading—5 cr. (5 and 0)

A continuation of Ed 011. Designed for students who have not acquired adequate reading skills as demonstrated by scores on entrance examinations or diagnostic tests. Study habits, vocabulary, content reading and diagnosis of students' problems including counseling for vocational and academic potential. Course meets five hours per week.

Ed 100—Orientation—1 cr. (1 and 0)

Lectures and discussions on teaching in addition to serving as teacher aides. Required of all students in Early Childhood Education, Elementary Education, Secondary Education, and Science Teaching.

Ed 101—Reading Improvement—1 cr. (0 and 2)

Developmental reading for University students who desire to improve reading skills; open to any University student, but priority given to referrals.

Ed 301—History of American Education—3 cr. (3 and 0)

Development of educational systems, theories and practices against a background of American social and intellectual history. *Prerequisite:* Junior standing or permission of the instructor.

Ed H301—History of American Education—3 cr. (3 and 0)

Honors section of Ed 301; admission by invitation.

Ed 302—Educational Psychology—3 cr. (3 and 0)

The nature, capacities, equipment, growth and development of the learner.

Ed H302—Educational Psychology—3 cr. (3 and 0)

Honors section of Ed 302; admission by invitation.

Ed 334—Child Growth and Development—3 cr. (3 and 0)

A study of the physical and emotional growth and development of the child. *Prerequisite:* Ed 302 or Psych 201.

Ed 335—Adolescent Growth and Development—3 cr. (3 and 0)

The physical and emotional growth and development of the adolescent. *Prerequisite:* Ed 302 or Psych 201.

Ed H335—Adolescent Growth and Development—3 cr. (3 and 0)

Honors section of Ed 335; admission by invitation.

Ed 336—Behavior of the Preschool Child—3 cr. (2 and 2)

A study of behavior of the preschool child, including observation and participation.

Ed 401—The Community College—3 cr. (3 and 0)

History and philosophy of the junior college, its functions, organization and administration.

Ed 405—Principles of Guidance—3 cr. (3 and 0)

Principles, procedures, and policies of the guidance services. For all personnel workers. *Prerequisite:* 6 semester hours in Education or Psychology.

Ed 406—History and Philosophy of Education—3 cr. (3 and 0)

An analysis of the development of modern education practices and philosophies with emphasis upon the historical and philosophical development in the United States.

Ed 412—Directed Teaching in Secondary School Subjects—6 cr. (1 and 15)
A program of supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for prospective teachers to obtain experiences in the subject area. Students to be sectioned according to teaching fields: English, History and Social Sciences, Mathematics, Modern Languages, Science. (Enrollment is subject to individual approval of instructor in charge and is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio necessary for graduation.)

Ed 424—Methods and Materials in Secondary School Instruction—3 cr. (3 and 0)
Development of instructional practices and materials appropriate for the secondary school; familiarization with curriculum materials. Students to be sectioned according to teaching area: English, History and Social Science, Mathematics, Modern Languages, Science.

Ed 431—Special Institute Course: Early Childhood Education—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 432—Special Institute Course: Elementary School—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 433—Special Institute Course: Secondary School—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 434—Special Institute Course: Current Problems in Education—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 435—Special Institute Course: Curriculum—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 436—Special Institute Course: Supervision and Administration—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 458—Health Education—3 cr. (3 and 0)
A study of the information needed for effective cooperation with parents, physicians and public health agencies in the promotion and improvement of community health, including problems of personal hygiene, health records, immunization, and control of communicable disease.

Ed 459—Fundamentals of Basic Reading—3 cr. (3 and 0)
Study of reading skills in relation to the psychological bases; developmental principles; historical and current issues in reading practices.

Ed 460—Curriculum Development in the Elementary School—3 cr. (3 and 0)
An analysis and evaluation of newer practices in curriculum planning in the elementary school.

Ed 461—Teaching Reading in the Elementary School—3 cr. (3 and 0)
Study of the various phases of reading and their relation to the elementary program. Emphasis on modern practices in the classroom teaching of reading.

ED 462—READING DIAGNOSIS AND REMEDIATION—3 cr. (2 and 3)
A clinical course in diagnostic and remedial procedures in the teaching of reading. Practice in the use of diagnostic instruments, interpretation of results, and case studies, with recommended remediation. Laboratory hours to be arranged with each individual. *Prerequisite:* 3 semester hours in reading or permission of the instructor.

ED 465—SECONDARY SCHOOL CURRICULUM—3 cr. (3 and 0)
A study of the principles, techniques, and trends in second school curriculum development and evaluation.

ED 466—CURRICULUM FOR EARLY CHILDHOOD EDUCATION—3 cr. (3 and 0)
Critical study of early childhood curriculum for nursery schools, kindergarten and early elementary grades.

ED 471—THE EXCEPTIONAL CHILD—3 cr. (3 and 0)
Survey of exceptionality including handicapped and gifted children; nature, cause, and treatment of difficulties; educational problems.

ED 472—PSYCHOLOGY OF MENTAL RETARDATION—3 cr. (3 and 0)
Psychological aspects of mental retardation; learning, motivation, and personality development.

ED 473—TEACHING THE MENTALLY RETARDED—3 cr. (3 and 0)
Study, selection, and preparation of curricular materials; methods of teaching retarded children within the pre-adolescent and adolescent range. *Prerequisite:* Ed 472 or equivalent.

ED 480—METHODS AND MATERIALS IN THE ELEMENTARY SCHOOL—3 cr. (3 and 0)
Study of the elementary program with emphasis upon materials, curriculum and methodology.

ED 481—DIRECTED TEACHING IN THE ELEMENTARY SCHOOL—6 cr. (1 and 15)
Supervised observation and teaching experiences in cooperation with selected elementary schools. (Enrollment is subject to individual approval of the instructor and is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

ED 483—METHODS AND MATERIALS FOR EARLY CHILDHOOD EDUCATION—3 cr. (3 and 0)
Study of methods and materials applicable to nursery schools, kindergarten and early elementary grades.

ED 484—DIRECTED TEACHING IN EARLY CHILDHOOD EDUCATION—6 cr. (1 and 15)
Supervised observation and teaching experiences in cooperation with nursery, kindergartens and early elementary schools. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

ED 487—METHODS AND MATERIALS IN SPEECH DEVELOPMENT—3 cr. (3 and 0)
Approved methods of teaching speech development; study of materials; experience in clinical methodology.

ED 491—DESCRIPTIVE STATISTICS—3 cr. (3 and 0)
Basic descriptive statistics and research methodology applicable to education, psychology and other social sciences.

ED 494—SCHOOL AND COMMUNITY RELATIONSHIPS—3 cr. (3 and 0)
A study of the interdependence of the school and community, with emphasis on educational implications.

ED 497—AUDIO-VISUAL AIDS IN EDUCATION—3 cr. (3 and 0)
The techniques and uses of audio-visual aids in improving teaching effectiveness.

ED 498—TEACHING SECONDARY SCHOOL READING—3 cr. (3 and 0)
Methods and materials of teaching basic and developmental reading skills; programming special services in reading instruction. Demonstrations of tests and devices.

ED 601—THE COMMUNITY COLLEGE—3 cr. (3 and 0)

ED 605—PRINCIPLES OF GUIDANCE—3 cr. (3 and 0)

ED 606—HISTORY AND PHILOSOPHY OF EDUCATION—3 cr. (3 and 0)

ED 631—SPECIAL INSTITUTE COURSE: EARLY CHILDHOOD EDUCATION—3 cr. (3 and 0)

ED 632—SPECIAL INSTITUTE COURSE: ELEMENTARY SCHOOL—3 cr. (3 and 0)

ED 633—SPECIAL INSTITUTE COURSE: SECONDARY SCHOOL—3 cr. (3 and 0)

ED 634—SPECIAL INSTITUTE COURSE: CURRENT PROBLEMS IN EDUCATION—3 cr. (3 and 0)

ED 635—SPECIAL INSTITUTE COURSE: CURRICULUM—3 cr. (3 and 0)

ED 636—SPECIAL INSTITUTE COURSE: SUPERVISION AND ADMINISTRATION—3 cr. (3 and 0)

ED 660—CURRICULUM DEVELOPMENT IN THE ELEMENTARY SCHOOL—3 cr. (3 and 0)

ED 662—READING DIAGNOSIS AND REMEDIATION—3 cr. (2 and 3)

ED 665—SECONDARY SCHOOL CURRICULUM—3 cr. (3 and 0)

ED 671—THE EXCEPTIONAL CHILD—3 cr. (3 and 0)

ED 672—PSYCHOLOGY OF MENTAL RETARDATION—3 cr. (3 and 0)

ED 673—TEACHING THE MENTALLY RETARDED—3 cr. (3 and 0)

ED 687—METHODS AND MATERIALS IN SPEECH DEVELOPMENT—3 cr. (3 and 0)

ED 694—SCHOOL AND COMMUNITY RELATIONSHIPS—3 cr. (3 and 0)

ED 697—AUDIO-VISUAL AIDS IN EDUCATION—3 cr. (3 and 0)

ED 698—TEACHING SECONDARY SCHOOL READING—3 cr. (3 and 0)

ED 801—SEMINAR IN HUMAN GROWTH AND DEVELOPMENT—3 cr. (3 and 0)

ED 802—HUMAN DEVELOPMENT: PSYCHOLOGY OF LEARNING—3 cr. (3 and 0)

Ed 803—Advanced Methods of Teaching in the Secondary School—3 cr. (3 and 0)

Ed 804—Advanced Methods of Teaching in the Elementary Grades—3 cr. (3 and 0)

Ed 808—Educational Tests and Measurements—3 cr. (3 and 0)

Ed 809—Analysis of the Individual—3 cr. (3 and 0)

Ed 810—Techniques of Counseling—3 cr. (3 and 0)

Ed 811—School Finance—3 cr. (3 and 0)

Ed 813—Educational and Vocational Informational Services and Placement—3 cr. (3 and 0)

Ed 814—Field Experiences in Elementary School Guidance—3 cr. (2 and 3)

Ed 815—Field Experiences in Secondary School Guidance—3 cr. (2 and 3)

Ed 816—Field Experiences in Personnel Services in Higher Education—3 cr. (2 and 3)

Ed 817—Clinical Studies in Counseling and Guidance—1 to 3 cr.

Ed 818—Field Problems in School Administration and Supervision of Instruction—3 cr. (2 and 3)

Ed 830—Techniques of Supervision—The Public Schools—3 cr. (3 and 0)

Ed 831—Evaluation of Secondary School Instruction—3 cr. (3 and 0)

Ed 832—Evaluation of Instruction in the Elementary Schools—3 cr. (3 and 0)

Ed 840—Research Utilization—3 cr. (3 and 0)

Ed 851—Organization and Administration of the Elementary Schools—3 cr. (3 and 0)

Ed 852—Organization and Administration of the Secondary School—3 cr. (3 and 0)

Ed 861—Organization and Supervision of Reading Programs—3 cr. (3 and 0)

Ed 862—Clinical Research in Reading—3 cr. (3 and 0)

Ed 863—Practicum in Reading—3 cr. (2 and 2)

Ed 871—Interpersonal and Group Relationships—3 cr. (3 and 0)

Ed 881—Individual Testing I—3 cr. (3 and 0)

Ed 882—Individual Testing II—3 cr. (3 and 0)

Ed 890—Introduction to Research in Education—3 cr. (3 and 0)

ELECTRICAL AND COMPUTER ENGINEERING

Professors: R. W. Gilchrist, J. W. Lathrop, J. T. Long, J. C. Martin, J. N. Thurston, L. C. Wilcox, *Acting Head*

Associate Professors: W. L. Ball, J. A. Chisman, T. L. Drake, L. T. Fitch, B. E. Gilliland, C. P. Goodin, R. N. Kersey, Jr., H. V. Poe, R. W. Snelsire, I. S. Tolins, M. L. Wolla, W. T. Zink

Assistant Professors: D. C. Amoss, H. J. Helgert, R. D. Stinaff

Instructors: J. R. Fraker, C. W. Malstrom

EE 298—Digital Computation; Systems and Programs—1 cr. (1 and 0)
An introduction to digital computation and digital computer systems: Historical background; components of the computer system; information flow; storage; basic algorithms; flow charting; and introduction to instruction writing.

EE 299—Digital Computation—2 cr. (1 and 2)
A programming course designed to prepare students for the efficient use of digital computers. Fortran and PL-1 languages are used. An ideal course for those desiring a short but comprehensive introduction to computing. *Prerequisite:* EE 298.

EE 307—Basic Electrical Engineering—3 cr. (3 and 0)
Electrical engineering for students who need a strong background in the subject, but who are not planning to specialize in the field. A firm foundation in circuit theory is provided in this course. *Prerequisite:* Math 206, Phys 221, and Phys 223.

EE 312—Electromechanics—3 cr. (2 and 2)
The principles of energy conversion are introduced with emphasis on electromagnetic and electromechanical devices. From these, the mathematical and equivalent circuit models are developed, considering nonlinear magnetic characteristics and linear approximation. These models facilitate representation of the devices in extended systems. In-laboratory studies are made on the characteristics of saturble reactors, magnetic amplifiers, loudspeakers, transformers, d-c motors and generators, and a-c motors and generators. These characteristics are compared with those of the mathematical models. *Prerequisite:* EE 330, 331 and 340.

EE 315—Information Theory—3 cr. (3 and 0)
A course designed for those interested in developing a precise definition of information, and then applying this definition to the study of communication. Coding and the effect of noise on the system will be discussed. In the last part of the course upper bounds on the rate at which a process can transmit information will be obtained. *Prerequisite:* Approval of department.

EE 320—Electronics I—2 cr. (2 and 0)
The fundamental principles of solid-state electronic devices including the structural properties of semi-conductors, charge carrier motion, p-n junction theory, and electrical circuit models of transistors. Emphasis is given to the physical principles describing the operation of modern electronics components. *Prerequisite:* Phys 221, 222.

EE 321—Electronics II—2 cr. (2 and 0)
Solid-state circuit theory covering the design of small signal—low frequency amplifiers and multistage and feedback systems; applications involving opera-

tional amplifiers, field effect transistors and integrated circuits are covered. *Prerequisite:* EE 320, 330, 331.

EE 325—ELECTRONICS AND ELECTROMAGNETICS LABORATORY I—1 cr. (0 and 2)

Laboratory projects dealing with instrumentation and measurement procedures associated with solid-state electronic devices and electromagnetic fields. *Prerequisite:* Concurrent enrollment in EE 320 and 340.

EE 326—ELECTRONICS AND ELECTROMAGNETICS LABORATORY II—1 cr. (0 and 2)

Experimentation in electronics circuits design and electronic systems analysis, including integrated circuits. Projects relating to studies of time varying fields, transmission lines, wave guides, and antennas are included. *Prerequisite:* EE 325. Concurrent enrollment in EE 321 and 341.

EE 327—ENGINEERING APPLICATIONS OF PROBABILITY AND RANDOM VARIABLES—3 cr. (3 and 0)

An introduction to probability and random variables with emphasis on engineering applications. Subjects which will be covered include: probability space, conditional probabilities, independent events, Bernoulii trials, random variables, distribution functions, functions of random variables, and correlation and power spectrum of stationary random processes. *Prerequisite:* Math 208.

EE 329—LOGIC AND COMPUTING DEVICES—3 cr. (2 and 2)

A study of logic with an introduction to propositional calculus and Boolean Algebra. Number systems and representation of information. The use of electric devices to implement logic functions and computing elements. The organization and structure of computing systems. *Prerequisite:* Approval of department.

EE 330—SYSTEMS I—2 cr. (2 and 0)

The systems concept and system analysis methods are developed. The system model is developed through the study of functions and data forms, perfect drivers, response, two terminal elements, system geometry, linear algebra and subsystems. Branch, node, mesh and state models are considered. Solution methods include the use of the analog and digital computer. Nonlinear components are introduced in simple systems. *Prerequisite:* Math 208 or approval of department.

EE H330—SYSTEMS I—2 cr. (2 and 0)

A special honors course in which the systems concept and system analysis methods are developed. The system model is developed through the study of functions and data forms, perfect drivers, response, two terminal elements, system geometry, linear algebra and subsystems. Branch, node, mesh, and state models are considered. Solution methods include the use of the analog and digital computer. Nonlinear components are introduced in simple systems. *Prerequisite:* Math 208 or approval of department.

EE 331—ELECTRIC CIRCUITS WORKSHOP I—2 cr. (0 and 4)

Computational sessions, demonstrations and laboratory projects are coordinated with EE 330 (Systems I) in the area of electrical phenomenon. Electrical instrumentation and measurement procedures are introduced to illustrate component modeling and network response. Applications involving both continuous and discrete behavior are discussed. Problem solving using digital and analog computers is emphasized. *Prerequisite:* Concurrent enrollment with EE 330.

EE H331—Electric Circuits Workshop I—2 cr. (0 and 4)

A special honors workshop including computational sessions, demonstrations, and laboratory projects are coordinated with EE H330 (Systems I) in the area of electrical phenomenon. Electrical instrumentation and measurement procedures are introduced to illustrate component modeling and network response. Applications involving both continuous and discrete behavior are discussed. Problem solving using digital and analog computers is emphasized. *Prerequisite:* Concurrent enrollment with EE H330.

EE 332—Systems II—2 cr. (2 and 0)

A continuation of Systems I. Transforms of equations and functions and formulation of system equations in the S-domain. Two-part and N-terminal components studies include input-output and transfer parameters, measurement procedures, and system reduction methods. Solution methods include the use of transforms, analog computers and digital computers. Optimization methods are introduced. *Prerequisite:* EE 330.

EE 333—Electric Circuits Workshop II—2 cr. (0 and 4)

A continuation of EE 331. Transfer function concepts, multiterminal component modeling and computer simulations are among topics covered. A variety of electrical devices and systems are discussed including machinery and other energy conversion and solid-state devices. *Prerequisite:* Concurrent enrollment in EE 332.

EE 340—Electric and Magnetic Fields I—2 cr. (2 and 0)

An introduction to classical electromagnetics. Topics include vector analysis, Coulomb's law, electric field intensity, Gauss's law, potential theory, solution of Laplace's equation, D.C. magnetic fields, magnetic circuits and devices, and forces in magnetic fields. *Prerequisite:* Math 208.

EE 341—Electric and Magnetic Fields II—2 cr. (2 and 0)

Continuation of EE 340 to include time-varying fields, Maxwell's equations, transmission lines, waveguides, and antennas. *Prerequisite:* EE 340.

EE 350—Digital Information Processing—3 cr. (2 and 2)

Introduction to the basic characteristics of general purpose digital computer systems. The computer is viewed as a discrete sequential processor operating on discrete data rather than as a high speed calculating device. Topics include: general machine organization and operation, information flow within the machine, internal and external data types and structures, data transfers and communication with external devices, and interrelations between software and hardware. The various levels of programming systems are reviewed, but the main emphasis is placed on lower-level languages which provide the means for more flexible control and utilization of the digital system. *Prerequisite:* Junior standing in engineering or physical sciences and consent of instructor.

EE 351—Real-Time Application of Digital Computers—3 cr. (2 and 2)

An introduction of the application and operation of digital computers in a real-time or near real-time environment. An extension of the topics of EE 350 with the main emphasis on real-time applications and on-line data acquisition and reduction. Topics include: hardware characteristics such as interrupt and data break facilities, analog-to-digital and digital-to-analog signal conversion, timing considerations, and programming systems. The utilization of the computer as a system control component is considered as well as its use in simulation. *Prerequisite:* EE 350 or approval of department.

EE 401—SEMINAR—1 cr. (1 and 0)

Emphasis is placed on methods of presenting engineering concepts appropriate to an industrial environment. Recent developments in the field of electrical engineering are discussed as examples with consideration being given to their economic as well as scientific significance. A library research paper is a required part of the course. *Prerequisite:* Senior standing.

EE 403—ENERGY CONVERSION—3 cr. (3 and 0)

Various methods of energy conversion, both electromechanical and direct. Fuel cells, magnetohydrodynamics, nuclear and other methods are discussed along with more conventional systems. *Prerequisite:* Approval of department.

EE 405—SPECIAL PROBLEMS—Variable credit.

Electrical Engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. *Prerequisite:* Approval of department.

EE H405—SPECIAL PROBLEMS—Variable credit.

A special honors course of Electrical Engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. *Prerequisite:* Approval of department.

EE 406—INTRODUCTION TO INTEGRATED CIRCUITS—3 cr. (3 and 0)

Integrated circuit technology, devices and applications. Discussion of fabrication methods, survey of standard circuit characteristics, design and layout principles, linear and digital circuit applications. *Prerequisite:* Senior standing.

EE 410—SYSTEMS III—3 cr. (3 and 0)

An extension of Systems II into more advanced topics including flow concepts, stability, synthesis, optimization, and analysis with digital machines using—CSMP-ECAP and other simulation programs. *Prerequisite:* EE 332.

EE 411—ELECTRICAL SYSTEMS WORKSHOP III—2 cr. (0 and 4)

A continuation of EE 333. Larger more complex systems are considered. Projects illustrating state space and classical control theory are undertaken. Network synthesis and analysis through digital simulations are also covered. *Prerequisite:* EE 333.

EE 412—DIGITAL CONTROL SYSTEMS—3 cr. (3 and 0)

A discussion of the technical and economic aspects of the field of digital control. Major emphasis is placed on the various hardware, installation, and use topics in the field as well as theoretical discussions of the theory of computer automatic control and systems optimization. A comprehensive preview of the status of current theoretical investigations and their place in the industrial control scene. Associated computer control hardware, such as process sensors, signal systems, and final control elements are also examined. Digital and hybrid simulation studies, as well as logic control system designs augment the theoretical presentations.

EE 419—Electrical Machinery Laboratory I—1 cr. (0 and 2)
A laboratory course designed to accompany EE 421. Includes measurements of A.C. and D.C. machine parameters, analog computer simulation with emphasis on control. *Prerequisite:* Enrollment in EE 421.

EE 420—Power Systems Analysis—3 cr. (3 and 0)
Study of electric power system operation. Subjects covered include transmission lines, load-flow studies, economic dispatching, symmetrical components, fault calculations, and introduction to power system stability. *Prerequisite:* EE 312.

EE 421—Electrical Machinery—3 cr. (3 and 0)
Characteristics of A.C. and D.C. machines are studied with emphasis on dynamic operation and control. *Prerequisite:* EE 333 and EE 341.

EE 422—Electronics III—2 cr. (2 and 0)
An introduction to logic circuits, switching devices, and electronic storage systems. Frequency response of electronic components and systems, oscillator fundamentals, principles of modulation and power supply design are also covered. *Prerequisite:* EE 321, EE 333.

EE 428—Communications Theory I—3 cr. (3 and 0)
A course in modern communications theory. Topics covered are Fourier transforms, power spectra, correlation, signals in linear networks, amplitude modulation, frequency modulation, sampling and pulse modulation. *Prerequisite:* EE 321.

EE 429—Fundamentals of Digital Computer Design—3 cr. (3 and 0)
This course is designed for senior engineering and science students who are interested in the organization, logic, and circuit aspects of digital computers. Preliminary investigation of algorithms for performing digital arithmetic operations is followed by a study of logic circuits, switching matrices, computer elements and computer organization. The course is concluded with the design of a digital computer. *Prerequisite:* EE 321.

EE 430—Communications Theory II—3 cr. (3 and 0)
A continuation of EE 428 with emphasis on the statistical properties of signals. Topics covered are random signals and noise, signal space and continuous channels, digital data systems, optimum detection theory. *Prerequisite:* EE 428 and 327.

EE 431—Digital Electronics—3 cr. (3 and 0)
Active and passive wave-shaping, memory, and switching circuits. *Prerequisite:* EE 422.

EE 432—Instrumentation—3 cr. (3 and 0)
Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments will be considered. Transduction devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature will be discussed. *Prerequisite:* EE 321 or approval of department.

EE 433—Digital Electronics Laboratory—1 cr. (0 and 2)
A laboratory course designed to accompany EE 431. *Prerequisite:* Concurrent registration in EE 431.

EE 434—Power Electronics—3 cr. (3 and 0)
A study of electronic devices and systems which are designed to control or regulate large amounts of power. Included are SCR applications to inverters, motor controls, high-current power supplies, frequency converters, etc. Also, high-current switching systems, voltage stabilizers, and other power applications of electronics are considered. *Prerequisite:* EE 422.

EE 435—Communications Circuits—3 cr. (3 and 0)
Communication circuits used in amplification, modulation, detection and other signal processing in modern communication systems. Recent developments in electronic devices, such as integrated circuits, will be considered as circuit components along with other solid state and vacuum electronic devices. *Prerequisite:* EE 422.

EE 436—Radiation and Wave Propagation—3 cr. (3 and 0)
Electromagnetic waves, waveguides, and antennas. *Prerequisite:* EE 341.

EE 437—Laser Technology and Applications—3 cr. (3 and 0)
An introduction to the design factors and operating principles of solid-state, gas, and semiconductor lasers, couched in the language of electrical engineering and electron physics. Applications of laser technology to such areas as communications, computers, measurements, and medicine are presented. The theory and applications of holography are explored. Special problems and demonstrations relative to electrical engineering application of lasers are designed to augment the theoretical presentations.

EE 450—Systems IV—3 cr. (3 and 0)
A continuation of Systems III. Modern control system concepts including matrices and vector spaces, state equations, sample data systems, controllability and observability, nonlinear systems and synthesis. Also advanced computations in optimizing parametric programming and simulation are done using the analog, digital, and hybrid computers. *Prerequisite:* EE 410.

EE 451—System Design Workshop IV—2 cr. (0 and 4)
A project oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Prerequisite:* EE 411.

EE 460—Computer-Aided Analysis and Design—3 cr. (3 and 0)
Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in the modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Prerequisite:* EE 332 or approval of department.

EE 461—Analog/Hybrid Computation and Simulation—3 cr. (2 and 2)
A continuation of the introductory analog concepts considered in EE 331 and 333. Topics include nonlinear modeling, function generation, signal

processing, and an introduction to hybrid computing. *Prerequisite:* EE 333 or approval of department.

EE 603—Energy Conversion—3 cr. (3 and 0)

EE 606—Introduction to Integrated Circuits—3 cr. (3 and 0)

EE 610—Systems III—3 cr. (3 and 0)

EE 611—Electrical Systems Workshop III—2 cr. (0 and 4)

EE 612—Digital Control Systems—3 cr. (3 and 0)

EE 619—Electrical Machinery Laboratory I—1 cr. (0 and 2)

EE 620—Power System Analysis—3 cr. (3 and 0)

EE 621—Electrical Machinery—3 cr. (3 and 0)

EE 622—Electronics III—2 cr. (2 and 0)

EE 628—Communications Theory I—3 cr. (3 and 0)

EE 629—Fundamentals of Digital Computer Design—3 cr. (3 and 0)

EE 630—Communications Theory II—3 cr. (3 and 0)

EE 631—Digital Electronics—3 cr. (3 and 0)

EE 632—Instrumentation—3 cr. (3 and 0)

EE 633—Digital Electronics Laboratory—1 cr. (0 and 2)

EE 634—Power Electronics—3 cr. (3 and 0)

EE 635—Communications Circuits—3 cr. (3 and 0)

EE 636—Radiation and Wave Propagation—3 cr. (3 and 0)

EE 637—Optics of Coherent and Noncoherent Electromagnetic Radiations—3 cr. (3 and 0)

EE 650—Systems IV—3 cr. (3 and 0)

EE 651—System Design Workshop IV—2 cr. (0 and 4)

EE 660—Computer-Aided Analysis and Design—3 cr. (3 and 0)

EE 661—Analog/Hybrid Computation and Simulation—3 cr. (2 and 2)

EE 801—Analysis of Linear Systems I—3 cr. (3 and 0)

EE 802—Analysis of Linear Systems II—3 cr. (3 and 0)

EE 803—Seminar—1 cr. (1 and 0)

EE 804—Network Synthesis I—3 cr. (3 and 0)

EE 805—Network Synthesis II—3 cr. (3 and 0)

EE 806—Nonlinear Networks and Systems I—3 cr. (3 and 0)

EE 807—Power System Stability—3 cr. (3 and 0)

EE 808—Energy Conversion—3 cr. (3 and 0)

EE 809—Advanced Computer Control Systems—3 cr. (3 and 0)

EE 810—Modern Control Theory I—3 cr. (3 and 0)

EE 811—Modern Control Theory II—3 cr. (3 and 0)

EE 812—SAMPLED DATA SYSTEMS—3 cr. (3 and 0)

EE 814—NONLINEAR AUTOMATIC CONTROLS—3 cr. (3 and 0)

EE 815—RANDOM DATA MEASUREMENTS AND ANALYSIS—3 cr. (3 and 0)

EE 819—DETECTION AND ESTIMATION THEORY—3 cr. (3 and 0)

EE 820—THEORY OF COMMUNICATIONS I—3 cr. (3 and 0)

EE 821—THEORY OF COMMUNICATIONS II—3 cr. (3 and 0)

EE 822—INFORMATION THEORY—3 cr. (3 and 0)

EE 823—INTEGRATED CIRCUIT TECHNOLOGY—3 cr. (3 and 0)

EE 824—APPLICATIONS OF INTEGRATED CIRCUITS—3 cr. (3 and 0)

EE 825—SOLID-STATE ELECTRONICS—3 cr. (3 and 0)

EE 826—LARGE-SCALE INTEGRATION—3 cr. (3 and 0)

EE 827—INSTRUMENTATION AND MEASUREMENTS—3 cr. (3 and 0)

EE 830—ELECTROMAGNETICS I—3 cr. (3 and 0)

EE 831—ELECTROMAGNETICS II—3 cr. (3 and 0)

EE 832—ANTENNA THEORY I—3 cr. (3 and 0)

EE 833—ANTENNA THEORY II—3 cr. (3 and 0)

EE 834—MICROWAVE ELECTRONICS—3 cr. (3 and 0)

EE 836—OPTICAL ELECTROMAGNETICS AND QUANTUM ELECTRONICS—3 cr. (3 and 0)

EE 850—COMPUTATION AND SIMULATION—3 cr. (3 and 0)

EE 851—THEORY AND DESIGN OF DIGITAL-ANALOG MACHINES—3 cr. (3 and 0)

EE 852—DIGITAL COMPUTERS AND INFORMATION PROCESSING—3 cr. (3 and 0)

EE 855—ARTIFICIAL INTELLIGENCE—3 cr. (3 and 0)

EE 856—PATTERN RECOGNITION—3 cr. (3 and 0)

EE 857—CODING THEORY—3 cr. (3 and 0)

EE 858—AUTOMATA THEORY—3 cr. (3 and 0)

EE 860—ENGINEERING APPLICATION OF OPTIMIZATION—3 cr. (3 and 0)

EE 861—FOUNDATION AND METHODOLOGY OF SYSTEMS ENGINEERING—3 cr. (3 and 0)

EE 863—ADVANCED PHYSICAL SYSTEMS I—3 cr. (3 and 0)

EE 864—ADVANCED PHYSICAL SYSTEMS II—3 cr. (3 and 0)

EE 870—BIOSYSTEMS ANALYSIS—3 cr. (3 and 0)

EE 890—SELECTED TOPICS IN ELECTRICAL ENGINEERING—3 cr. (3 and 0)

EE 891—RESEARCH—3 cr.

EE 991—DOCTORAL RESEARCH—Credit to be arranged.

ENGINEERING

ENGR 101—ENGINEERING SYSTEMS—Non-credit (1 and 0)

A series of lectures outlining the role and scope of engineering in service to mankind. Emphasis is placed on the difference between science and engineering, the emerging role of engineering in new technology, the important technological needs of mankind, and the importance of the humanities and social studies to the engineer.

ENGR 491—SEMINAR—1-3 cr. (1-3 and 0)

A study of the dynamic role of engineering in relationship to man and his environment. Topics not covered in formal courses will be presented to keep students abreast of today's rapidly changing technology. *Prerequisite:* Permission of instructor.

ENGINEERING GRAPHICS

Professor: E. LAITALA, *Head*

Associate Professors: B. E. DUNKLE, A. F. HAMMOND, L. H. JAMESON, C. M. MCHUGH, R. L. PERRY

Assistant Professors: C. W. CARTER, C. D. MEEKS

Instructor: C. O. HUEY

EG 101—FREEHAND SKETCHING—1 cr. (0 and 3)

Principles of technical sketching, including the development of skills in technical lettering and freehand orthographic and pictorial drawing.

EG 103—ENGINEERING COMMUNICATIONS—3 cr. (1 and 6)

The role of engineering communication in engineering and management. Graphic communication includes lettering, sketching, orthographic projection, auxiliary projection, sections and conventional practices, dimensioning, working drawings. Architectural drawing, charts and graphs, presentation techniques. Manufacturing philosophy; interrelation between product design and production processes. For Industrial Management majors.

EG 104—ENGINEERING COMMUNICATION AND DESIGN—2 cr. (0 and 6)

The role of engineering communication from the manager's point of view. Working drawings relating product design and production processes. Architectural drawing nomography, charts and graphs, presentation techniques. *Prerequisite:* EG 109 or consent of instructor.

EG 105—ENGINEERING GRAPHICS—2 cr. (0 and 6)

A course in graphical communication. Freehand sketching, orthographic and auxiliary projection, sectional views, and conventional practices, dimensioning, reading drawings.

EG 109—ENGINEERING GRAPHICAL COMMUNICATION—2 cr. (0 and 6)

Graphical methods of communicating ideas and information in engineering. Development of the student's ability to visualize three dimensional forms and spatial relationships through the study of creative freehand sketching and basic fundamentals of engineering representation. Use of drafting aids, introduction to computer graphics, curve plotting, reproduction methods.

EG 110—ENGINEERING COMMUNICATION (FOR TECHNICAL OPERATIONS)—2 cr. (0 and 6)

A continuation of EG 109. Emphasis is placed on engineering drawing as a means of expressing a design. Standard practices and procedures. Dimensioning for interchangeability, numerical control, and quantity production. Component design. Developments and intersections.

EG 201—ENGINEERING GRAPHICS FOR INDUSTRIAL EDUCATION—3 cr. (1 and 6)

A comprehensive study of Engineering Graphics fundamentals. The course includes lettering, use of instruments, technical sketching, multi-viewing drawing, auxiliary projection, descriptive geometry, sectional views, dimensioning, fasterners, detail and assembly drawings.

EG 202—GRAPHICAL TECHNOLOGY FOR INDUSTRIAL EDUCATION—3 cr. (1 and 6)

Continuation of EG 201 with emphasis on depth in graphical communication. Working drawings to include detail and assembly drawings. Intersections and developments. Specifications, standards. Architectural drawings. Production illustration, pedagogy of graphics, pragmatic and creative design. *Prerequisite:* EG 201.

EG 301—ADVANCED ENGINEERING GRAPHICS—3 cr. (1 and 6)

Application of the fundamental principles of Engineering Graphics to the solution of three dimensional spatial problems in the design of various engineering systems. Creative functional design, introduction to graphical kinematics and computer-aided design. *Prerequisite:* EG 109 or 202.

EG 302—GRAPHICAL COMPUTATION—3 cr. (2 and 3)

Graphic layouts of empirical equations. The application of graphical solution of equations, nomography, and the graphical calculus to the solution of problems in engineering and science. Graphical solution of differential equations. *Prerequisite:* EG 109, Math 106 or equivalent.

ENGINEERING MANAGEMENT

Professors: C. C. DAVIS, B. J. TODD, C. H. WHITEHURST, JR.

Associate Professors: F. R. GRAY, E. A. LAROCHE, G. D. RIGGS, C. O. SHULER, C. R. SMITH, J. M. WANNAMAKER

Assistant Professors: T. H. GUNTER, JR., J. A. TURNER

EMGT 910—SEMINAR IN PRODUCTION MANAGEMENT—2 cr. (2 and 0)

EMGT 911—SEMINAR IN DECISION THEORY—2 cr. (2 and 0)

EMGT 912—SEMINAR IN FINANCE—3 cr. (3 and 0)

EMGT 913—SYSTEMS ANALYSIS—3 cr. (3 and 0)

EMGT 991—DOCTORAL RESEARCH—Credit to be arranged.

ENGINEERING MECHANICS

Professors: N. R. Bauld, Jr., R. W. Moorman, *Head*

Associate Professors: W. E. Castro, R. E. Elling, J. G. Goree, A. G. Law, R. F. Nowack, M. K. Richardson, P. B. Zielinski

Assistant Professor: C. R. Mitchell

EM 201—Engineering Mechanics (Statics)—3 cr. (3 and 0)
Forces and force systems and their external effect on bodies; principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, concurrent registration in Math 206.

EM H201—Engineering Mechanics (Statics)—3 cr. (3 and 0)
An honors section of EM 201; admission by invitation.

EM 202—Engineering Mechanics (Dynamics)—3 cr. (3 and 0)
A continuation of EM 201. The principal topics are kinematics and kinetics of particles and bodies of finite size. Techniques of vector mathematics are employed. *Prerequisite:* EM 201, Math 206.

EM H202—Engineering Mechanics (Dynamics)—3 cr. (3 and 0)
An honors section of EM 202; admission by invitation.

EM 211—Particle Mechanics: Statics and Dynamics—3 cr. (3 and 0)
Force and force systems and their effect on particles; the conditions of equilibrium and the kinematics and kinetics of particle motion. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, Math 206.

EM 304—Mechanics of Materials—3 cr. (3 and 0)
The relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. *Prerequisite:* EM 201 and Math 206.

EM H304—Mechanics of Materials—3 cr. (3 and 0)
An honors section of EM 304; admission by invitation.

EM 305—Mechanics of Materials Laboratory—1 cr. (0 and 3)
Theoretical relationships considered in EM 304 are verified. Students observe the behavior under load and the failure of engineering materials identify and evaluate mechanical properties of materials important to design and manufacturing processes; and are acquainted with various testing methods, testing machines, and instruments. *Prerequisite:* Must be accompanied or preceded by EM 304.

EM 320—Fluid Mechanics—3 cr. (3 and 0)
The behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is placed upon a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Prerequisite:* EM 202 or EM 211.

EM H320—Fluid Mechanics—3 cr. (3 and 0)
An honors section of EM 320; admission by invitation.

EM 322—Fluid Mechanics Laboratory—1 cr. (0 and 3)
The principles developed in EM 320 are verified and demonstrated. Familiarization with orderly techniques in organizing and reporting results of experimental investigations and with the use of instruments and equipment is afforded. *Prerequisite:* Must be accompanied or preceded by EM 320.

EM 421—Hydrology and Hydraulics—2 cr. (2 and 0)
Elements of surface water and ground water hydrology are introduced and applied to engineering problems. Special topics of open channel hydraulics and water distribution systems are developed from the fundamentals of fluid mechanics. *Prerequisite:* EM 320.

EM 425—Advanced Mechanics of Materials—3 cr. (3 and 0)
A continuation of EM 304. This course includes traditional topics in strength of materials, such as shear center, unsymmetrical bending, torsion of non-circular sections, curved members, and elastic stability. Additionally, introduces topics from theory of elasticity as related to simple bending and torsion problems. *Prerequisite:* EM 304.

EM 450—Mechanical Vibrations—3 cr. (3 and 0)
Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include: linear free vibrations, forced vibrations and damping in single degree of freedom systems, transient response, multidegree of freedom systems with lumped parameters, Lagrange's equations. *Prerequisite:* EM 202, 304, and Math 208.

EM 470—Experimental Stress Analysis I—3 cr. (2 and 3)
Experimental analysis of static and dynamic stress fields. Emphasis is on the techniques required to obtain data and the theoretical analysis required for proper interpretation. Methods and instrumentation associated with strain gages (including transducer applications), moiré girds, brittle coatings, birefringent coatings, and photoelasticity are studied.

EM 621—Hydrology and Hydraulics—2 cr. (2 and 0)

EM 625—Advanced Mechanics of Materials—3 cr. (3 and 0)

EM 650—Mechanical Vibrations—3 cr. (3 and 0)

EM 670—Experimental Stress Analysis I—3 cr. (2 and 3)

EM 802—Experimental Stress Analysis II—3 cr. (2 and 3)

EM 821—Continuum Mechanics—3 cr. (3 and 0)

EM 823—Dimensional Analysis and Dynamic Similarity—3 cr. (3 and 0)

EM 827—Topics in Analytical Mechanics—3 cr. (3 and 0)

EM 829—Energy Methods and Variational Principles—3 cr. (3 and 0)

EM 831—Theory of Elasticity I—3 cr. (3 and 0)

EM 832—Theory of Elasticity II—3 cr. (3 and 0)

EM 834—Theory of Elastic Stability—3 cr. (3 and 0)

EM 845—Intermediate Dynamics—3 cr. (3 and 0)

EM 851—Fluid Dynamics—3 cr. (3 and 0)

EM 852—Theory of Ideal Fluid Flow—3 cr. (3 and 0)

EM 853—Theory of Viscous Fluid Flow—3 cr. (3 and 0)

EM 856—Flow in Open Channels—3 cr. (3 and 0)

EM 881—Special Problems—3 cr. (3 and 0)

EM 889—Seminar—0 or 1 cr. (1 and 0)

EM 890—Seminar—0 or 1 cr. (1 and 0)

EM 891—Research—Credit to be arranged.

EM 932—Theory of Plasticity—3 cr. (3 and 0)

EM 980—Special Topics in Mechanics—3 cr. (3 and 0)

EM 981—Special Topics in Mechanics—3 cr. (3 and 0)

EM 982—Special Topics in Mechanics—3 cr. (3 and 0)

EM 983—Special Topics in Mechanics—3 cr. (3 and 0)

EM 991—Doctoral Research—Credit to be arranged.

ENGLISH

Professors: R. J. Calhoun, H. M. Cox, C. B. Green, M. A. Owings, *Head*

Associate Professors: C. O. Caskey, A. J. Fear, H. M. Felder, Jr., C. Gum, L. L. Henry, Harriet R. Holman, A. H. Holt, J. L. Idol, C. M. McGee, Jr., J. J. McLaughlin, N. Olsen, Jr., M. S. Steadman, Jr., C. H. Watson, J. P. Winter

Assistant Professors: R. E. Barfield, H. B. Bryant, R. L. Cross, T. E. Douglass, H. B. Hannah, C. M. Israel, A. L. Recoulley III, R. O. Rogers, Corinne H. Sawyer, J. B. Simms, B. N. Skardon, R. A. Underwood, M. O. Usrey, E. P. Willey, C. H. Woodell

Instructors: Mary S. Adams, Ottie W. Arrington, R. F. Barton, J. D. Blanche, W. V. Bost, Joan T. Cross, S. K. Eisiminger, Virginia L. Ganim, D. N. Griffin, R. B. Heaton, Jr., W. B. Wood, Jr.

Engl 011—English—5 cr. (5 and 0)
Writing centered around sentence structure and the single paragraph. Prose readings to accompany class work.

Engl 013—English—5 cr. (5 and 0)
Extensive writing of compositions longer than a paragraph. Prose, non-fiction readings to accompany class work.

Engl 101—English Composition—3 cr. (3 and 0)
Training in correct and effective expression, in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods.

Engl H101—English Composition—3 cr. (3 and 0)
Honors section of Engl 101; admission by invitation.

Engl 102—English Composition—3 cr. (3 and 0)
Continued emphasis on correct and effective expression; an introduction to non-fiction prose, fiction, drama, and poetry; training in the organization and writing of the research report. *Prerequisite:* Engl 101.

ENGL H102—ENGLISH COMPOSITION—3 cr. (3 and 0)
Honors section of Engl 102; admission by invitation.

ENGL 105—FUNDAMENTALS OF ORAL COMMUNICATION—3 cr. (3 and 0)
Introduction to the problems of oral communication in the following areas: oral reading, listening, discussion, speaking, with emphasis on individual needs; oral exercises.

ENGL 111—ENGLISH FOR FOREIGN STUDENTS—3 cr. (3 and 2)
A special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examinations in oral English.

ENGL 203—A SURVEY OF ENGLISH LITERATURE—3 cr. (3 and 0)
Chief British authors and works from Beowulf through the Romantic period; continued emphasis on composition. *Prerequisite:* Engl 102.

ENGL H203—SURVEY OF ENGLISH LITERATURE—3 cr. (3 and 0)
Honors section of Engl 203; admission by invitation.

ENGL 204—A SURVEY OF ENGLISH AND AMERICAN LITERATURE—3 cr. (3 and 0)
Chief British authors and works from the Victorian period to the present time, and selected readings from American literature. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 203 or permission of the Department.

ENGL H204—SURVEY OF ENGLISH AND AMERICAN LITERATURE—3 cr. (3 and 0)

Honors section of Engl 204; admission by invitation.

ENGL 215—INTRODUCTION TO DRAMA—3 cr. (3 and 0)
Introduction to drama as a literary form through readings of representative plays from Aeschylus to Ibsen. *Prerequisite:* Engl 101, 102.

ENGL 217—VOCABULARY BUILDING—3 cr. (3 and 0)
Development of a useful, discriminating vocabulary for writing, speaking, and reading. Student notebooks and proficiency quizzes. *Prerequisite:* Engl 101 and 102.

ENGL 221—THE CLASSICS IN TRANSLATION—3 cr. (3 and 0)
An examination of the whole of the *The Iliad, The Odyssey, Hesiod's Theogony, The Aeneid, The Metamorphoses,* Apuleius's *The Golden Asse,* and selections from Herodotus and Tacitus. *Prerequisite:* Engl 101, 102.

ENGL 223—CONTINENTAL FICTION IN TRANSLATION—3 cr. (3 and 0)
Selected fiction of the European masters, primarily Russian, French, German, and Spanish. *Prerequisite:* Engl 101, 102.

ENGL 231—INTRODUCTION TO JOURNALISM—3 cr. (3 and 0)
Instruction and practice in writing for mass media; editorial responsibilities. *Prerequisite:* Engl 102.

ENGL 240—BLACK AMERICAN LITERATURE—3 cr. (3 and 0)
Black American literature from its beginning to the present. A critical examination of essays, short stories, novels, drama, and poetry produced by the Black American. *Prerequisite:* Engl 101 and 102.

ENGL 300—JOURNALISM WORKSHOP—1 cr. (1 and 0)
Responsibilities and duties of students editing uncensored publications; criticism of student publications. Open only to members of publication staffs. *Prerequisite:* Engl 102.

ENGL 301—PUBLIC SPEAKING—3 cr. (3 and 0)
Practical training in public speaking; attention to diction, voice, and platform presence; an introduction to parliamentary procedure; practice in writing and delivering short speeches. *Prerequisite:* Sophomore standing.

ENGL 302—PERSUASION—3 cr. (3 and 0)
The theories and art of ethical oral persuasion. The composition and delivery of speeches of a persuasive nature to convince, to stimulate, and to actuate. *Prerequisite:* Engl 301.

ENGL 303—VOICE AND DICTION—3 cr. (3 and 0)
Practical training in speech, with emphasis on clarity, vocal variety, and tone quality.

ENGL 304—ADVANCED COMPOSITION—3 cr. (3 and 0)
Supervised writing for students of advanced standing, each student undertaking projects according to his interest; some attention to reports, business letters, research methods and materials. Weekly papers and some larger exercises. Limited enrollment. *Prerequisite:* Engl 203 or 204.

ENGL 305—ORAL INTERPRETATION OF LITERATURE—3 cr. (3 and 0)
Analysis and oral interpretation of selected poetry and prose; training in development of effective tone production. *Prerequisite:* Engl 101, 102.

ENGL 306—DEBATING—1 cr. (1 and 0)
The application of debating to contemporary problems. May be repeated until a maximum of three credits has been earned. *Prerequisite:* Permission of the instructor.

ENGL 308—PRINCIPLES OF ACTING—3 cr. (3 and 0)
Acting for the stage, basic techniques of characterization, audition procedures, exercises in emotional recall and pantomime, experience in supervised performance. *Prerequisite:* Engl 101, 102.

ENGL 310—INTRODUCTION TO THE THEATRE—3 cr. (3 and 0)
The history of play production from the Greeks to modern times. The role of lighting, costuming, set design and other elements in play production. *Prerequisite:* Junior standing.

ENGL 311—THEATRE LABORATORY—1 cr. (0 and 3)
Participation in theatre production including stage management, direction, costume, makeup, lighting, sound, scenery, and business management. No formal class meetings. One credit. May be repeated for a total of three credits. *Prerequisite:* Sophomore standing and permission of the instructor.

ENGL 331—CREATIVE WRITING—3 cr. (3 and 0)
The technique of non-expository writing—narration, description, dramatization. *Prerequisite:* Sophomore standing or higher and permission of the instructor.

ENGL 332—CREATIVE WRITING—3 cr. (3 and 0)
A continuation of Engl 331. *Prerequisite:* Engl 331 or permission of the instructor.

ENGL 333—THE STRUCTURE OF FICTION—3 cr. (3 and 0)
A study of the short story, the novella, and the novel from the writer's point of view. *Prerequisite:* Permission of the instructor.

ENGL 351—CHILDREN'S LITERATURE—3 cr. (3 and 0)
Wide reading in prose and verse suitable for children in elementary grades. *Prerequisite:* Engl 203 and 204.

ENGL 352—ADOLESCENT LITERATURE—3 cr. (3 and 0)
Wide reading in prose and verse suitable for children in secondary schools. *Prerequisite:* Engl 203 and 204.

ENGL 362—SPEECH IN THE ELEMENTARY CLASSROOM—3 cr. (3 and 0)
The development of oral communication skills in children and the use of speech improvement activities to motivate spontaneous, accurate self-expression. *Prerequisite:* Junior standing.

ENGL 402—THE ENGLISH LANGUAGE—3 cr. (3 and 0)
Studies in English usage and the historical development of the language. *Prerequisite:* Engl 203 and 204.

ENGL 404—THE STRUCTURE OF MODERN ENGLISH—3 cr. (3 and 0)
Structural linguistic analysis; principles of phonology, morphology, and syntax as related to traditional, structural, and transformational grammars. Recommended for English teachers. *Prerequisite:* Engl 203, 204.

ENGL 405—SHAKESPEARE—3 cr. (3 and 0)
An introduction to Shakespeare's plays through a study of the tragedies *Hamlet, Othello, King Lear, Macbeth, Anthony* and *Cleopatra,* and of the two tragic plays *Romeo and Juliet* and *Julius Caesar. Prerequisite:* Engl 203, 204.

ENGL 406—SHAKESPEARE—3 cr. (3 and 0)
A selective study of Shakespeare's comedies and histories. *Prerequisite:* Engl 203 and 204.

ENGL 409—CHAUCER—3 cr. (3 and 0)
Chaucer as an artist; the "Prologue" for historical and linguistic orientation; "The Canterbury Tales," "House of Fame," "Parliament of Fowls," and "Troilus and Criseyde" as art forms. *Prerequisite:* Engl 203 and 204.

ENGL 413—CLASSICAL DRAMA—3 cr. (3 and 0)
Selected readings in the dramatic literature of classical Greece and Rome. *Prerequisite:* Engl 203 and 204.

ENGL 416—MODERN DRAMA—3 cr. (3 and 0)
Principles and progress of drama from Ibsen to the present; analysis of representative plays; critical reports; discussion of trends in contemporary drama. *Prerequisite:* Engl 203 and 204.

ENGL 422—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
The Colonial Period to the Civil War, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 423—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
From the Civil War to the early twentieth century, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 424—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
Twentieth century, with emphasis on major authors. (Not open to those who have passed Engl 438.) *Prerequisite:* Engl 203 and 204.

ENGL 425—THE ROMANTIC REVIVAL—3 cr. (3 and 0)
The eighteenth-century forerunners of Romanticism; Wordsworth, Coleridge, Byron, Shelley, Keats. *Prerequisite:* Engl 203 and 204.

ENGL 427—VICTORIAN POETRY—3 cr. (3 and 0)
Extensive readings from the poets of the Victorian Age. *Prerequisite:* Engl 203 and 204.

ENGL 429—NINETEENTH CENTURY PROSE—3 cr. (3 and 0)
Readings in the fiction of the nineteenth century after Jane Austen and in the essays of the Romantic and Victorian periods. *Prerequisite:* Engl 203 and 204.

ENGL 431—THE RESTORATION AND EIGHTEENTH CENTURY—3 cr. (3 and 0)
Readings in Dryden, Swift, Pope, and Dr. Johnson. *Prerequisite:* Engl 203 and 204.

ENGL 435—SOUTHERN LITERATURE—3 cr. (3 and 0)
The intellectual and literary achievement of the South from 1607 to the present, with emphasis upon the writers of the nineteenth century. *Prerequisite:* Engl 203 and 204.

ENGL 436—MILTON AND HIS AGE—3 cr. (3 and 0)
The development of Milton's thought and art in relation to his times and to the writings of his contemporaries. *Prerequisite:* Engl 203 and 204.

ENGL 437—THE EIGHTEENTH CENTURY ENGLISH NOVEL—3 cr. (3 and 0)
A critical and historical study of the English novel from Defoe to Jane Austen. *Prerequisite:* Engl 203 and 204.

ENGL 438—TWENTIETH CENTURY POETRY—3 cr. (3 and 0)
The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. (Not open to those who have completed Engl 424.) *Prerequisite:* Engl 203 and 204.

ENGL 439—TWENTIETH CENTURY FICTION—3 cr. (3 and 0)
American and British novelists and short story writers of the twentieth century. *Prerequisite:* Engl 203 and 204.

ENGL 440—APPLIED LITERARY CRITICISM—3 cr. (3 and 0)
Major critical approaches to literature, in theory and practice, from Aristotle to the present. *Prerequisite:* Engl 203 and 204.

ENGL 441—A SURVEY OF WORLD LITERATURE I—3 cr. (3 and 0)
Translations from the Hellenic, Hebraic, and Oriental worlds, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 442—A SURVEY OF WORLD LITERATURE II—3 cr. (3 and 0)
Translations from the Medieval, Renaissance and Modern worlds, with emphasis on major authors. *Prerequisite:* Engl 203 and 204.

ENGL 443—SEVENTEENTH CENTURY POETRY AND PROSE—3 cr. (3 and 0)
A survey of British authors of the seventeenth century other than Shakespeare and Milton. *Prerequisite:* Engl 203 and 204.

ENGL 445—RENAISSANCE NON-DRAMATIC LITERATURE—3 cr. (3 and 0)
Tudor and Elizabethan poetry, prose fiction, translations, essays, and criticism. *Prerequisite:* Engl 203 and 204.

ENGL 446—TUDOR-STUART DRAMA—3 cr. (3 and 0)
Selected readings in non-Shakespearean dramatic literature of the sixteenth and seventeenth centuries. *Prerequisite:* Engl 203 and 204.

ENGL 447—THE AMERICAN NOVEL—3 cr. (3 and 0)
A survey of the most significant forms and themes of the American novel from its beginnings to 1900. *Prerequisite:* Engl 203 and 204.

ENGL 461—STUDIES IN ENGLISH LITERATURE TO 1700—3 cr. (3 and 0)
Selected readings in English literature from the beginnings to 1700, with emphasis on social and intellectual backgrounds. *Prerequisite:* Engl 203, 204.

ENGL 462—STUDIES IN ENGLISH LITERATURE SINCE 1700—3 cr. (3 and 0)
Selected readings in English literature from 1700 to the present, with emphasis on social and intellectual backgrounds. *Prerequisite:* Engl 203, 204.

ENGL H470—SENIOR DIVISION HONORS ENGLISH—3 cr. (3 and 0)
An intensive study of a period, topic, genre, or figure. Papers, reports, reading list, examination. *Prerequisite:* Engl 203, 204 or H203, H204 and approval of the Honors Council. May be repeated by arrangement with the Department for a total of twelve credits.

ENGL 481—DIRECTED READING—1, 2, or 3 cr. (1, 2, or 3 and 0)
Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. May be repeated for a maximum of six credits. *Prerequisite:* Engl 203, 204 or H203, H204, and invitation of the department.

ENGL 602—THE ENGLISH LANGUAGE—3 cr. (3 and 0)

ENGL 604—THE STRUCTURE OF MODERN ENGLISH—3 cr. (3 and 0)

ENGL 605—SHAKESPEARE—3 cr. (3 and 0)

ENGL 606—SHAKESPEARE—3 cr. (3 and 0)

ENGL 609—CHAUCER—3 cr. (3 and 0)

ENGL 613—CLASSICAL DRAMA—3 cr. (3 and 0)

ENGL 616—MODERN DRAMA—3 cr. (3 and 0)

ENGL 622—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 623—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 624—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 625—THE ROMANTIC REVIVAL—3 cr. (3 and 0)

ENGL 627—VICTORIAN POETRY—3 cr. (3 and 0)

ENGL 629—NINETEENTH CENTURY PROSE—3 cr. (3 and 0)

ENGL 631—THE RESTORATION AND EIGHTEENTH CENTURY—3 cr. (3 and 0)

ENGL 635—SOUTHERN LITERATURE—3 cr. (3 and 0)

ENGL 636—MILTON AND HIS AGE—3 cr. (3 and 0)

ENGL 637—THE EIGHTEENTH CENTURY ENGLISH NOVEL—3 cr. (3 and 0)

ENGL 638—TWENTIETH CENTURY POETRY—3 cr. (3 and 0)

ENGL 639—TWENTIETH CENTURY FICTION—3 cr. (3 and 0)

ENGL 640—APPLIED LITERARY CRITICISM—3 cr. (3 and 0)

ENGL 641—A SURVEY OF WORLD LITERATURE—3 cr. (3 and 0)

ENGL 642—A SURVEY OF WORLD LITERATURE—3 cr. (3 and 0)

ENGL 643—SEVENTEENTH CENTURY POETRY AND PROSE—3 cr. (3 and 0)

ENGL 645—RENAISSANCE NON-DRAMATIC LITERATURE—3 cr. (3 and 0)

ENGL 646—TUDOR-STUART DRAMA—3 cr. (3 and 0)

ENGL 647—THE AMERICAN NOVEL—3 cr. (3 and 0)

ENGL 651—CHILDREN'S LITERATURE—3 cr. (3 and 0)

ENGL 661—STUDIES IN ENGLISH LITERATURE TO 1700—3 cr. (3 and 0)

ENGL 662—STUDIES IN ENGLISH LITERATURE SINCE 1700—3 cr. (3 and 0)

ENGL 801—THE TEACHING OF ENGLISH—3 cr. (3 and 0)

ENGL 802—STUDIES IN MIDDLE ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 803—STUDIES IN RENAISSANCE ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 804—STUDIES IN NEO-CLASSIC AND ROMANTIC LITERATURE—3 cr. (3 and 0)

ENGL 805—STUDIES IN VICTORIAN AND MODERN ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 810—STUDIES IN COLONIAL AND REVOLUTIONARY AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 811—STUDIES IN ROMANTIC AND REALISTIC AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 812—STUDIES IN MODERN AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 820—STUDIES IN THEORETICAL AND APPLIED LITERARY CRITICISM—3 cr. (3 and 0)

ENGL 830—STUDIES IN LINGUISTICS—3 cr. (3 and 0)

ENGL 840—STUDIES IN WORLD LITERATURE—3 cr. (3 and 0)

ENGL 890—INTRODUCTION TO RESEARCH—1 cr. (1 and 0)

ENGL 891—RESEARCH—Credit to be arranged.

ENTOMOLOGY

Professors: T. R. Adkins, Jr., R. C. Fox, E. W. King, J. K. Reed

Associate Professor: S. B. Hays, *Head*

Assistant Professors: G. R. Carner, R. F. Nash, R. Noblet, T. E. Skelton

Ent 200—Insects—2 cr. (2 and 0)

An introduction to insects; their various relationships with man, other animals and plants. The general nature of this course makes it beneficial to all students regardless of specialty.

Ent 301—General Entomology—3 cr. (2 and 3)

A general introduction to entomology with emphasis on anatomy, metamorphosis, and description of the most common insect species. Methods of control are introduced and current control practices are explained for some of the most important species.

Ent 307—Forest Entomology—3 cr. (2 and 3) F

Insects of economic importance to forests, forest products and shade trees, and their role in the practice of good forest management as well as their significance in the natural environment.

Ent 308—Apiculture—3 cr. (2 and 3)

A detailed study of the honey bee and its economic importance in pollination and honey production. Attention will be given to bee behavior, colony management, equipment, honey plant identification, and honey production and processing. *Prerequisite:* Zool 102, 104 and permission of the instructor.

Ent 401—Field Crop and Stored Product Insects—3 cr. (2 and 3)

Common insect pests of the following are studied: cotton, corn, small grains, legume field crops, tobacco, stored grain and seed. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

Ent 402—Fruit, Nut, and Vegetable Insects—3 cr. (2 and 3)

Common insect pests of the following are studied: peaches, apples, grapes, pecans, sweet corn, cole crops, cucurbits, potatoes, sweet potatoes, peas and beans. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

Ent 405—Insect Morphology—4 cr. (3 and 3) F

A study of insect structure in relation to function and of the variation of form in insects. *Prerequisite:* Ent 301.

Ent H405—Insect Morphology—4 cr. (3 and 3) F

Honors option for Ent 405, admission by special arrangement.

Ent 410—Insect Taxonomy—3 cr. (1 and 6)

The identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification; lecture material deals with necessary theoretical discussion of taxonomic features observed in the laboratory. *Prerequisite:* Zool 102, 104; Ent 301; Ent 405 desirable.

Ent 455—Medical and Veterinary Entomology—3 cr. (2 and 3) S

Insects and their arthropod relatives which are of considerable economic importance in their effect on man and animals.

ENT 461—SEMINAR—1 cr. (1 and 0) F
Students review the principal journals pertaining to insects and related animals; also review the lives and activities of prominent pioneer entomologists. *Prerequisite:* Zool 102, 104; Ent 301.

ENT 462—SEMINAR—1 cr. (1 and 0) S
Continuation of Ent 461.

ENT 468—INTRODUCTION TO RESEARCH—2 cr. (1 and 3) S
Principles, developments and changes in research methods related to certain fields of biological and agricultural research. The students obtain practice in experimental techniques, scientific writing and the use and maintenance of various research instruments and equipment.

ENT 601—FIELD CROP AND STORED PRODUCT INSECTS—3 cr. (2 and 3)

ENT 602—FRUIT, NUT, AND VEGETABLE INSECTS—3 cr. (2 and 3)

ENT 610—INSECT TAXONOMY—3 cr. (1 and 6)

ENT 655—MEDICAL AND VETERINARY ENTOMOLOGY—3 cr. (2 and 3)

ENT 668—INTRODUCTION TO RESEARCH—2 cr. (1 and 3)

ENT 808—TAXONOMY OF IMMATURE INSECTS—3 cr. (1 and 6)

ENT 809—RECENT ADVANCES IN ENTOMOLOGY I—1 cr. (1 and 0)

ENT 810—RECENT ADVANCES IN ENTOMOLOGY II—1 cr. (1 and 0)

ENT 856—MEDICAL ENTOMOLOGY—3 cr. (2 and 3)

ENT 860—PRINCIPLES OF INSECT CONTROL—3 cr. (3 and 0)

ENT 861—INSECT TOXICOLOGY—3 cr. (2 and 3)

ENT 862—INSECT PHYSIOLOGY—3 cr. (2 and 3)

ENT 863—SPECIAL PROBLEMS IN ENTOMOLOGY—3 to 6 cr.

ENT 890—RESEARCH TECHNIQUES IN AGRICULTURE—3 cr. (2 and 3)

ENT 891—RESEARCH—Credit to be arranged.

ENT 991—DOCTORAL RESEARCH—Credit to be arranged.

ENVIRONMENTAL HEALTH

Associate Professor: R. F. BORGMAN, *Program Director*

ENH 471—MAN AND HIS ENVIRONMENT—2 cr. (2 and 0)
The interactions of man with his environment will be surveyed. Health factors such as urbanization, population growth, pathogens, insects and other vectors, ionizing radiation, and toxic chemical residues will be emphasized. The effects of air, water, food, and solid waste contacts will be considered. *Prerequisite:* Permission of instructor.

ENH 472—ENVIRONMENTAL PLANNING AND CONTROL—2 cr. (2 and 0)
Application of planning and design to effective environmental control. Topics such as land use, water supply and treatment, waste water treatment and disposal, and solid waste disposal will be considered from the standpoint of control. Not intended for graduate students in Engineering. *Prerequisite:* Permission of the instructor.

EnH 671—Man and His Environment—2 cr. (2 and 0)

EnH 672—Environmental Planning and Control—2 cr. (2 and 0)

EnH 893—Environmental Health Seminar I—1 cr. (1 and 0)

ENVIRONMENTAL SYSTEMS ENGINEERING

Professors: J. F. Andrews, *Head;* J. H. Austin, L. G. Rich
Associate Professors: A. R. Abernathy, B. C. Dysart
Assistant Professor: T. M. Keinath
Lecturer: G. M. McCallum
Adjunct Professors: D. W. Duttweiler, W. M. Sanders

ESE 443—Environmental Engineering Chemistry I—2 cr. (2 and 0)
A study of those fundamental principles of physical and analytical chemistry that find application in the treatment of waters and waste-waters. Chemical thermodynamics, chemical kinetics, acid-base equilibria, solubility equilibria, complex equilibria, and electrochemistry, are several topics that are examined.

ESE 444—Environmental Engineering Chemistry Laboratory I—2 cr. (0 and 6)
Demonstration of the principles discussed in ESE 443 and laboratory exercises in those analytical methods used in water quality control. Typical wet-chemical analytical techniques demonstrated are residue analysis, turbidity, color, alkalinity, acidity, pH, hardness, iron, manganese, dissolved oxygen, and biochemical oxygen demand. Moreover, several modern instrumental and electroanalytical techniques that are commonly incorporated in environmental water quality monitors are discussed and demonstrated in detail.

ESE 643—Environmental Engineering Chemistry I—2 cr. (2 and 0)

ESE 644—Environmental Engineering Chemistry Laboratory I—2 cr. (0 and 6)

ESE 842—Sanitary Engineering Processes—3 cr. (3 and 0)

ESE 843—Unit Operations of Sanitary Engineering—3 cr. (3 and 0)

ESE 846—Pollution of the Aquatic Environment—3 cr. (2 and 3)

ESE 848—Environmental Engineering Chemistry II—2 cr. (2 and 0)

ESE 849—Environmental Engineering Chemistry Laboratory II—2 cr. (1 and 3)

ESE 851—Unit Operations and Processes Laboratory—2 cr. (1 and 3)

ESE 852—Water and Wastewater Treatment System:—3 cr. (2 and 3)

ESE 854—Water and Waste Transport Systems—3 cr. (3 and 0)

ESE 861—Environmental Systems Engineering Seminar—0-1 cr. (1 and 0)

ESE 862—Environmental Quality Case Study—1 cr. (0 and 3)

ESE 874—Radiological Health Engineering—3 cr. (2 and 3)

ESE 881—Special Problems—1 to 4 cr.

ESE 883—Selected Topics in Environmental Engineering—3 cr. (3 and 0)

ESE 884—Selected Topics in Environmental Engineering—3 cr. (3 and 0)

ESE 891—Research—1-6 cr.

ESE 991—Doctoral Research—1-18 cr.

EXPERIMENTAL STATISTICS

Professor: W. P. Byrd

Assistant Professors: J. R. Holman, W. E. Johnston, J. S. Lytle

Ex St 301—Introductory Statistics—3 cr. (2 and 2) F, S, SS
Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. The role of statistics in interpreting research, and the general application of the methods are stressed.

Ex St 462—Statistics Applied to Economics—3 cr. (3 and 0) S
A continuation of Ex St 301 with emphasis on statistical methods used in the collection, analysis, presentation and interpretation of economic data. Special attention is given to time series analysis, the construction of index numbers and the designing of samples for surveys in the social science fields. *Prerequisite:* Ex St 301.

Ex St 662—Statistics Applied to Economics—3 cr. (3 and 0)

Ex St 801—Statistical Methods—4 cr. (3 and 3)

Ex St 803—Regression and Least Squares Analysis—3 cr. (3 and 0)

Ex St 804—Sampling—3 cr. (3 and 0)

Ex St 805—Design and Analysis of Experiments—3 cr. (3 and 0)

FOOD SCIENCE

Professors: J. H. Mitchell, Jr., W. P. Williams, *Head*

Assistant Professors: J. C. Acton, J. J. Jen, M. G. Johnson

Fd Sc 212—Man's Food Resources—2 cr. (2 and 0) S, '73 and alternate years.
Food material resources with reference to quality preservation, processing, and nutritional requirements. The role of science and technology in the modern food industry is emphasized. The need for food standards and grades is explained, and the functions of regulatory agencies are discussed. *Prerequisite:* Biol 101.

Fd Sc 305—Dairy and Food Engineering—3 cr. (2 and 3) F, '72
A study of the basic engineering principles and their application to the dairy and food processing operations. The relationship between engineering principles and fundamentals of food processing is emphasized for the dairy and food technologist. Topics include material and energy balance, electricity and

power, steam generation, refrigeration, transfer of heat, flow and mechanics of fluids, evaporation and distillation, strength of materials and kinetics of biological reactions.

Fd Sc 311—Food Processing—3 cr. (3 and 0)
F, '71 and alternate years.
Principles of food handling and processing by refrigerated storage, freezing, canning, fermentation, sugar concentration, and food additives. *Prerequisite:* Organic Chemistry and Physics.

Fd Sc 312—Food Processing—3 cr. (3 and 0)
S, '72 and alternate years.
Principles of dehydration. Unit processes and manufacturing methods used in the processing of cereal grains, dairy products, meats and fish, vegetable oils, beverages, and confectioneries. Importance of water supply and waste disposal in food manufacture. *Prerequisite:* Organic Chemistry and Physics.

Fd Sc 313—Food Processing Laboratory—1 cr. (0 and 3)
F, '71 and alternate years.
Laboratory exercises dealing with equipment and processes used in food manufacture. *Prerequisite:* Registration in Fd Sc 311.

Fd Sc 314—Food Processing Laboratory—1 cr. (0 and 3)
S, '72 and alternate years.
A continuation of Fd Sc 313. *Prerequisite:* Registration in Fd Sc 312.

Fd Sc 412—Food Quality Control—2 cr. (2 and 0) S, '73
A comprehensive treatment of the philosophy and organization of and the responsibility for food quality control function. Major emphasis is placed on principles, quality attributes, government and trade standards of identity and their development, acceptance sampling (inspection), recording and reporting, and production and inventory control.

Fd Sc 413—Biochemistry of Foods—2 cr. (2 and 0)
F, '71 and alternate years.
Biochemical and enzymatic phenomena in relation to the color, texture, flavor, and nutritive value of foods, changes in biochemical constituents as a result of food processing and storage. *Prerequisite:* Ch 310 or Bioch 423 or permission of instructor.

Fd Sc 414—Food Quality Control Laboratory—2 cr. (1 and 3) S, '73
Fundamental aspects of sensory techniques employed in the quality evaluation of food products. A study of laboratory methods employed in product evaluation and grading of processed foods. A concept of quality is formed through examination of various grades of each food product. Actual practice in the selection and operation of taste panels illustrate their use in the industry.

Fd Sc 415—Human Nutrition—2 cr. (2 and 0)
F, '71 and alternate years.
Characteristics and functions of basic food nutrients and how they are affected by food processing, preservation and storage methods. Pathways for the conversion of nutrients into living tissue will be examined. *Prerequisite:* Ch 310 or Bioch 423 or permission of instructor.

Fd Sc 416—Food Analysis—2 cr. (1 and 3)
S, '72 and alternate years.
Application of quantitative procedures to the analysis of food products. Procedures include solids, protein, carbohydrates, lipids, vitamins, fiber, pigments, and other components. *Prerequisite:* Quantitative analysis or permission of instructor.

Fd Sc 417—Seminar—1 cr. (1 and 0) F, '72
Literature research and oral presentation of current food science topics.

Fd Sc 418—Seminar—1 cr. (1 and 0) S, '73
Literature research and oral presentation of current food science topics.

Fd Sc 420—Special Topics in Food Science—1-3 cr. (1-3 and 0) S, '71
A comprehensive study of special topics in Food Science not covered in other courses. Special emphasis will be placed on independent investigations of contemporary developments.

Fd Sc 612—Food Quality Control—2 cr. (2 and 0)

Fd Sc 613—Biochemistry of Foods—2 cr. (2 and 0)

Fd Sc 614—Food Quality Control Laboratory—2 cr. (1 and 3)

Fd Sc 615—Human Nutrition—2 cr. (2 and 0)

Fd Sc 616—Food Analysis—2 cr. (1 and 3)

FORESTRY

Professors: R. M. Allen, *Head;* B. M. Cool, K. Lehotsky, J. R. Warner
Associate Professors: M. H. Bruner, R. E. Schoenike, W. A. Shain
Assistant Professors: C. L. Lane, T. E. Wooten

For 101—Introduction to Forestry—1 cr. (1 and 0) F
An informative sketch of forestry, forests, and forestry tasks of the nation; education in career opportunities of foresters.

For 102—Introduction to Forestry—1 cr. (1 and 0) S
A continuation of For 101.

For 205—Dendrology—4 cr. (3 and 3) F
Identification and nomenclature of the principal forest trees of the United States; their geographical distribution and economic importance; identification of many forest shrubs and commonly planted exotics. *Prerequisite:* Bot 102.

For 206—Silvics—2 cr. (2 and 0) S
Growth factors influencing the establishment and development of forest trees and stands. *Prerequisite:* Bot 102, Ch 102.

For 251S—Silvics—2 cr. (Summer Camp) SS
Field studies of growth factors influencing the establishment and development of forest stands. *Prerequisite:* Agron 202, Bot 356, For 205, For 206.

For 252S—Forest Engineering—2 cr. (Summer Camp) SS
Field surveying, establishment of boundary lines, planning and construction of forest trails and roads. *Prerequisite:* CE 201, EG 105.

For 253S—Dendrometry—4 cr. (Summer Camp) SS
Elements of mensuration dealing with volume determination of standing and harvested trees as well as forest stands. *Prerequisite:* CE 201, EG 105, For 205.

For 254S—Forest Products—1 cr. (Summer Camp) SS
Field studies of logging methods and equipment; trips to selected wood-using industries. *Prerequisite:* For 205 or permission of instructor.

For 302—Dendrometry—3 cr. (2 and 3) S
Volume determination of trees, logs, and stands; statistical procedures applied to forest measurements. *Prerequisite:* Ex St 301 and Forestry Summer Camp.

For 304—Forest Economics—3 cr. (3 and 0) S
Economic problems and principles involved in the utilization of forest land and timber and in the distribution of forest products; cost analysis of integrated forest operations. *Prerequisite:* Econ 201.

For 306—Identification of Wood and Wood Fibers—1 cr. (0 and 3) S
Macroscopic and microscopic identification, properties, and uses of selected economically significant timbers. *Prerequisite:* Bot 102, Ch 102 or permission of instructor.

For 307—Elements of Forestry—3 cr. (2 and 3) F, S
A compendium of forestry subjects providing a broad view of the management and utilization of forests, especially those of South Carolina. Not open to Forestry majors. *Prerequisite:* Bot 102 or permission of instructor.

For 308—Aerial Photographs in Forestry—3 cr. (2 and 3) S
Use of aerial photographs in forestry; elementary photographic measurements; aerial photo interpretations; mapping and timber estimating procedures. *Prerequisite:* CE 201 and Forestry Summer Camp or permission of instructor.

For 310—Silviculture—4 cr. (3 and 3) S
Maintenance, harvesting, natural and artificial regeneration of forest stands based on the interrelation of biotic characteristics of stands and their environment. *Prerequisite:* For 206 and Forestry Summer Camp.

For 401—Logging and Milling—4 cr. (2 and 6) F
Logging and milling methods and costs, their administration; analysis of logging and milling operations; seasoning, grading, and marketing of lumber. *Prerequisite:* Senior standing.

For 403—Forest Soils Seminar—1 cr. (1 and 0)
Forest soil characteristics with respect to site evaluation, forest fertilization, planting problems, watershed management and tree-soil-microorganism interactions.

For 412—Forest Protection—2 cr. (2 and 0) S
Causative and control factors of forest fires; fire prevention and suppression. Protection of forest resources against damages caused by man and animals. *Prerequisite:* Senior standing.

For 414—Management Plans—1 cr. (0 and 3) S
Analysis and assembling of factors entering into a forest working plan; drawing of maps corollary to forest regulation; preparation of management plans. *Prerequisite:* For 407.

For 416—Forest Policy and Administration—2 cr. (2 and 0) S
Development of public and private forest policy in the United States; administrative and executive tasks in forestry; principles of organization, personnel management, and budget. *Prerequisite:* Senior standing.

For 417—Forest Regulation—4 cr. (3 and 3) F
Correlation of production factors and yields of forests; normal and empirical forests; rotations and cutting cycles; regulation of cuts and growing stock in sustained yield management. *Prerequisite:* For 302, 310.

For 418—Forest Valuation—3 cr. (3 and 0) S
Capital investments in forestry and the returns derivable from them; valuation of land, timber, and other resources associated with forestry; appraisal of damage and stumpage values. *Prerequisite:* For 304, 407.

For 420—Forest Products—3 cr. (2 and 3) S
Primary forest products other than sawlogs, e.g., poles, pulpwood, veneer stock, excelsior; secondary forest products, e.g., naval stores, maple syrup, Christmas trees; utilization and marketing of forest products. *Prerequisite:* Phys 208 and Senior standing.

For 421—Wood Properties I—3 cr. (2 and 3)
The formation of wood in forest trees; gross and minute characteristics of wood; defects in wood; variability in wood. *Prerequisite:* Bot 102, For 306 or permission of instructor.

For 422—Wood Properties II—3 cr. (2 and 3)
Wood in relation to moisture, heat, sound, light, and electricity; mechanical properties of wood; standard testing procedures for wood. *Prerequisite:* For 306 or permission of instructor.

For 601—Logging and Milling—4 cr. (2 and 6)

For 602—Dendrometry—3 cr. (2 and 3)

For 604—Forest Economics—3 cr. (3 and 0)

For 606—Identification of Wood and Wood Fibers—1 cr. (0 and 3)

For 607—Elements of Forestry—3 cr. (2 and 3)

For 608—Aerial Photographs in Forestry—3 cr. (2 and 3)

For 610—Silviculture—4 cr. (3 and 3)

For 612—Forest Protection—2 cr. (2 and 0)

For 614—Management Plans—1 cr. (0 and 3)

For 616—Forest Policy and Administration—2 cr. (2 and 0)

For 617—Forest Regulation—4 cr. (3 and 3)

For 618—Forest Valuation—3 cr. (3 and 0)

For 620—Forest Products—3 cr. (2 and 3)

For 621—Wood Properties I—3 cr. (2 and 3)

For 622—Wood Properties II—3 cr. (2 and 3)

For 801—Data Processing in Forestry Problems—3 cr. (2 and 3)

For 802—Dendrometry—3 cr. (2 and 3)

For 803—Photo-Interpretation—3 cr. (2 and 3)

For 804—Forest Economics—3 cr. (2 and 3)

For 805—Cost Studies in Harvesting and Processing—3 cr. (2 and 3)

For 806—Multiple Use Management—3 cr. (3 and 0)

For 807—Special Problems in Forestry—Credit to be arranged.

For 891—Research—Credit to be arranged.

FRENCH

Associate Professor: J. A. Dean

Assistant Professors: D. Y. Brannock,* R. R. McGregor, Jr., J. A. McNatt, J. B. Macy

Instructors: Irene A. Aiem, D. J. Calvez, M. A. Kirsch, Germaine M. Lafitte, H. A. Lewis, Elke M. Maron, G. A. Strader

Fr 101—Elementary French—3 cr. (3 and 1)
A course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr H101—Elementary French—3 cr. (3 and 1)
Honors section of Fr 101; admission by invitation.

Fr 102—Elementary French—3 cr. (3 and 1)
A continuation of Fr 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr H102—Elementary French—3 cr. (3 and 1)
Honors section of Fr 102; admission by invitation.

Fr 151—French for Graduate Students—0 cr. (0 and 0)
An intensive program for graduate students preparing to take the reading examination in French. Some previous study of the language is helpful but not essential.

Fr 201—Intermediate French—3 cr. (3 and 1)
Attention to grammar, with conversation, composition and dictation continued from Fr 102, and the beginning of more serious reading of French prose in short stories or novels. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr H201—Intermediate French—3 cr. (3 and 1)
Honors section of Fr 201; admission by invitation.

Fr 202—Intermediate French—3 cr. (3 and 0)
While attention is paid to writing and speaking French, more stress is laid on the rapid reading of more difficult French prose than in the earlier courses. *Prerequisite:* Fr 201.

Fr H202—Intermediate French—3 cr. (3 and 0)
Honors section of Fr 202; admission by invitation.

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* On leave.

Fr 303—Survey of French Literature I—3 cr. (3 and 0)
Literary movements and authors from the beginnings to the eighteenth century. Required of French majors. *Prerequisite:* Fr 201 and 202.

Fr 304—Survey of French Literature II—3 cr. (3 and 0)
Literary movements and authors of the nineteenth and twentieth centuries. Required of French majors. *Prerequisite:* Fr 201 and 202.

Fr 305—Conversational French—3 cr. (3 and 0)
Practice in the spoken language, with stress on vocabulary building, pronunciation, intonation, and comprehension; written work to increase accuracy. Assignments in the language laboratory. Required of French majors. *Prerequisite:* Fr 201 and 202.

Fr 306—Advanced Conversation with Composition—3 cr. (3 and 0)
A continuation of Fr 305, with additional emphasis on written composition. *Prerequisite:* Fr 305.

Fr 307—French Civilization—3 cr. (3 and 0)
A study of the significant aspects of the culture of France from its origins to the present. *Prerequisite:* Fr 202 or Departmental permission.

Fr 308—Contemporary French Culture—3 cr. (3 and 0)
A study of contemporary ideas, opinions and events through magazines, newspapers, scholarly journals of individual interest and essays of national and international import. Class discussions; oral and written reports. *Prerequisite:* Fr 202 or Departmental permission.

Fr 403—Twentieth Century Prose—3 cr. (3 and 0)
The outstanding authors of the first half of the twentieth century: Proust, Gide, Mauriac, Saint-Exupéry, Sartre, Camus, and others. Reading of selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

Fr 404—Twentieth Century Drama—3 cr. (3 and 0)
The French theater since 1900, with emphasis on the period after 1930. Readings, discussions, and reports. *Prerequisite:* Fr 303 or 304.

Fr 405—Nineteenth Century French Romanticism—3 cr. (3 and 0)
The romantic movement as expressed in the works of Chateaubriand, Hugo, Merimée, Vigny, Stendhal, Sand, and others. Readings, discussions, and reports. *Prerequisite:* Fr 303 or 304.

Fr 406—Nineteenth Century French Realism—3 cr. (3 and 0)
Realism as expressed in the works of Balzac, Flaubert, Daudet, Maupassant, Zola, and others. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

Fr 407—Eighteenth Century French Literature—3 cr. (3 and 0)
The principal literary figures of the eighteenth century, with particular emphasis on Voltaire and Rousseau. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

Fr 408—Seventeenth Century French Drama—3 cr. (3 and 0)
The French classical drama, with emphasis on Corneille, Racine, and Molière. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

GENETICS

Professor: C. M. Jones

Assistant Professor: J. D. Maxwell

Gen 301—Genetics—3 cr. (3 and 0) F

An introduction to the basic principles of genetics and the relationship of these principles to man. To include deleterious genes, chromosome abnormalities, and mutations as these affect the human race; sex-linked, sex-influenced and sex-limited traits; and genetic predictions and population genetics in relation to society. Will not substitute for Gen 302.

Gen 302—Genetics—4 cr. (3 and 3) F, S, SS

A general coverage of the basic principles of genetics. Examples illustrating the fundamentals of heredity and variation are given for plants and animals, including man. *Prerequisite:* Biol 101, Bot 102, 104, and Zool 102, 104 or consent of instructor.

Gen 451—Genetics—3 cr. (3 and 0) S

Methods and concepts in classical and modern genetics. Topics will include advanced studies of linkage; variations in chromosome number and structure; natural and induced mutations; extranuclear inheritance; experimental evolution; population, biochemical and medical genetics. Principles will be illustrated by examples from plants, animals (including man), and microorganisms. *Prerequisite:* Gen 302.

Gen 602—Genetics—4 cr. (3 and 3)

Gen 651—Genetics—3 cr. (3 and 0)

Gen 801—Cytogenetics—3 cr. (2 and 3)

GEOGRAPHY

Geog 201—Introduction to Geography—3 cr. (3 and 0)

An introduction to the study of geography, including maps, the physical elements of the natural environment and their distribution, and world cultural patterns.

Geog 301—Economic Geography—3 cr. (3 and 0)

The geographic conditions fundamental to the world's resources—agricultural, mineral, commercial and industrial, and the conditions which affect the utilization, marketing, consumption and strategic significance of these resources.

Geog 302—Political Geography—3 cr. (3 and 0)

The geographic basis for and the geographic problems of the modern state; the relevance of geographical patterns to international affairs. *Prerequisite:* Junior standing or permission of the instructor.

GEOLOGY

Associate Professors: P. K. Birkhead, V. S. Griffin, Jr., R. D. Hatcher, Jr.
Assistant Professors: G. M. Haselton, D. S. Snipes

Geol 201—Physical Geology—4 cr. (3 and 3)

A study of the minerals and rocks which compose the earth's crust, their origins and transformations. Emphasis is placed upon geological processes, both internal and external, by which changes are produced on or in the earth. Laboratory instruction is provided in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results.

Geol 202—Historical Geology—4 cr. (3 and 3)

Evolution, both organic and inorganic, is traced from the beginning of the record up through time to the present. Laboratory instruction and field trips provide practice in the identification and study of plants and animals which have left their record as fossils in the rocks of the earth's crust. Emphasis is placed upon geologic structures and the interpretation of geologic maps. *Prerequisite:* Geol 201.

Geol 306—Mineralogy—3 cr. (2 and 3)

The student gains a working knowledge of crystallography and a comprehensive knowledge of determinative mineralogy. Identification of the minerals is based on their physical and chemical properties. *Prerequisite:* Geol 201 or 406.

Geol 309—Petrology—3 cr. (2 and 3)

The genesis, evolution, and classification of rocks through lectures, laboratory exercises, and field trips. The occurrences, chemical relationships, and distribution of rock types are emphasized. *Prerequisite:* Geol 306.

Geol 310—Optical Mineralogy—3 cr. (2 and 2)

The purpose of this course is to enable the student to identify minerals under the microscope on the basis of their optical properties. *Prerequisite:* Geol 306.

Geol 313—Stratigraphy and Sedimentation—3 cr. (3 and 0)

The process by which sediments are eroded, transported, and deposited (sedimentation), with major emphasis on relationships of the areal and time distribution of stratified rocks and their historical significances (stratigraphy). *Prerequisite:* Geol 201 or 406.

Geol 402—Structural Geology—3 cr. (2 and 2)

The diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. *Prerequisite:* Geol 201 or 406.

Geol 403—Invertebrate Paleontology—3 cr. (2 and 3)

A study of life of past geologic ages, as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. *Prerequisite:* Geol 201 or permission of the instructor.

Geol 404—Economic Geology—3 cr. (3 and 0)

This course concerns the description and classification of ore deposits and commercial non-metallic mineral deposits. The origin of mineral deposits and their occurrence is emphasized. Problem studies and field trips to nearby mines and quarries. *Prerequisite:* Geol 306

GEOL 405—GEOMORPHOLOGY—4 cr. (3 and 3)
A study of the surface features of the earth—their form, nature, origin, development, and the change they are undergoing. *Prerequisite:* Geol 201 and 202 or Geol 406 or permission of the instructor.

GEOL 406—ENGINEERING GEOLOGY—3 cr. (2 and 3)
This course is similar to Geol 201 except that progress is faster and emphasis is on the relationship of geology to engineering.

GEOL 407—GLACIAL GEOLOGY—3 cr. (2 and 2)
Study of the types of glaciers, their distribution, nourishment and wastage. Continental and mountain glaciation, past and present, and the forms and deposits associated therewith. Ice contact forms, their significance and origins. *Prerequisite:* Geol 201 and 202, or Geol 406.

GEOL 408—GEOHYDROLOGY—3 cr. (3 and 0)
Study of the hydrologic cycle, aquifer characteristics, theory of ground water movement, mechanics of well flow, experimental methods, and subsurface mapping. *Prerequisite:* Geol 201 and 202, or Geol 406.

GEOL 411—RESEARCH PROBLEMS—3 cr. (0 and 9)
A field, laboratory, or library study of an approved topic in geology. The topic would be one not normally covered in formal course offering, but may be an extension of a course. *Prerequisite:* Senior standing in geology or approval of the Department Head.

GEOL 412—RESEARCH PROBLEMS—3 cr. (0 and 9)
A continuation of Geol 411.

GEOL 602—STRUCTURAL GEOLOGY—3 cr. (2 and 2)

GEOL 603—INVERTEBRATE PALEONTOLOGY—3 cr. (2 and 3)

GEOL 604—ECONOMIC GEOLOGY—3 cr. (3 and 0)

GEOL 605—GEOMORPHOLOGY—4 cr. (3 and 3)

GEOL 606—MINERALOGY—3 cr. (2 and 3)

GEOL 607—GLACIAL GEOLOGY—3 cr. (2 and 2)

GEOL 608—GEOHYDROLOGY—3 cr. (3 and 0)

GEOL 609—PETROLOGY—3 cr. (2 and 3)

GEOL 610—OPTICAL MINERALOGY—3 cr. (2 and 2)

GEOL 611—RESEARCH PROBLEMS—1-3 cr. (0 and 3-9)

GEOL 613—STRATIGRAPHY AND SEDIMENTATION—3 cr. (3 and 0)

GEOL 800—EARTH SCIENCE I—3 cr. (2 and 3)

GEOL 850—EARTH SCIENCE II—3 cr. (2 and 3)

GERMAN

Assistant Professor: Patricia W. Wannamaker

Instructors: E. P. Arnold, Margaret S. Graham, H. L. Laws, Jr.

Ger 101—Elementary German—3 cr. (3 and 1)

A course for beginners in which, through conversation, composition and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Ger H101—Elementary German—3 cr. (3 and 1)

Honors section of Ger 101; admission by invitation.

Ger 102—Elementary German—3 cr. (3 and 1)

A continuation of Ger 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

Ger H102—Elementary German—3 cr. (3 and 1)

Honors section of Ger 102; admission by invitation.

Ger 151—German for Graduate Students—0 cr. (0 and 0)

An intensive program for graduate students preparing to take the reading examination in German.

Ger 201—Intermediate German—3 cr. (3 and 1)

A short review of grammar, with conversation, composition and dictation continued from Ger 102, and the beginning of more serious reading of German prose in short stories or novels. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Ger H201—Intermediate German—3 cr. (3 and 1)

Honors section of Ger 201; admission by invitation.

Ger 202—Intermediate German—3 cr. (3 and 0)

While attention is paid to writing and speaking German, more stress is laid on the rapid reading of more difficult German prose than in the earlier courses. *Prerequisite:* Ger 201.

Ger H202—Intermediate German—3 cr. (3 and 0)

Honors section of Ger 202; admission by invitation.

Ger 251—Scientific German—3 cr. (3 and 0)

An alternate course to Ger 202; readings in general science and some review of grammar and syntax. *Prerequisite:* Ger 201.

Ger 303—Survey of German Literature I—3 cr. (3 and 0)

Chief authors and works from the Hildebrandslied through the Aufklärung. Required of German majors. *Prerequisite:* Ger 201 and 202.

Ger 304—Survey of German Literature II—3 cr. (3 and 0)

Literary movements and works from Heine through Brecht. Required of German majors. *Prerequisite:* Ger 201 and 202.

Ger 305—Conversational German—3 cr. (3 and 0)

Practice in the spoken language, with emphasis on vocabulary, pronunciation, and comprehension; written exercises for accuracy; assignments in the language laboratory. Required of German majors. *Prerequisite:* Ger 202 or 251.

GER 306—ADVANCED CONVERSATION WITH COMPOSITION—3 cr. (3 and 0)
Continuation of Ger 305 with additional emphasis on written composition. *Prerequisite:* Ger 305.

GER 307—CONTEMPORARY GERMAN CULTURE I—3 cr. (3 and 0)
A study of significant aspects of the contemporary culture of Germany through readings in current German periodicals on a wide variety of subjects: art, music, literature, economics, travel and human interest topics. *Prerequisite:* Ger 202 or 251, or departmental permission.

GER 308—CONTEMPORARY GERMAN CULTURE II—3 cr. (3 and 0)
A continuation of Ger 307. *Prerequisite:* Ger 202 or 251, or departmental permission.

GER 403—NINETEENTH CENTURY GERMAN LITERATURE—3 cr. (3 and 0)
Selected works of Heine, Hebbel, Grillparzer, Keller, Meyer, Hauptmann, Schnitzler, and Hofmannsthal. Readings, discussions, and reports. *Prerequisite:* Ger 303 or 304.

GER 404—20TH CENTURY GERMAN LITERATURE—3 cr. (3 and 0)
Selected works from authors of the twentieth century. *Prerequisite:* Ger 303 and 304.

GER 405—THE AGE OF GOETHE—3 cr. (3 and 0)
The development of German literature during Goethe's lifetime, 1749-1832; Aufklärung, Sturm und Drang, Klassiq, Romantik. *Prerequisite:* Ger 303 or 304.

GER 406—FAUST—3 cr. (3 and 0)
An intensive reading of Goethe's masterpiece accompanied by extensive critical research. *Prerequisite:* Ger 303 and 304.

HISTORY

Professors: C. W. BOLEN, R. S. LAMBERT,* E. M. LANDER, JR.*

Assistant Professors: H. D. ADAMS, J. L. ARBENA, J. W. BARNHILL,* RUBY S. DAVIS, C. A. GRUBB, PATRICIA K. HILL, R. P. LEEMHUIS, RAMETH R. OWENS, J. V. REEL, JR., R. L. SAUNDERS, JR., W. F. STEIRER, JR., D. P. SULEIMAN, A. VIGLIONE

Instructors: BETTINA K. BEER, J. R. BEER, C. M. JOEKEL II, J. Y. LEBOURGEOIS, A. D. MCCLARE, W. L. PIPPIN, JR., ANN R. RUSSELL, J. E. SARGENT, D. S. TRASK, T. M. VERICH

HIST 101—AMERICAN HISTORY—3 cr. (3 and 0)
The political, economic and social development of the American people from the period of discovery to the end of Reconstruction.

HIST H101—AMERICAN HISTORY—3 cr. (3 and 0)
Same as Hist 101 except that this honors section is open to students only by invitation.

HIST 102—AMERICAN HISTORY—3 cr. (3 and 0)
The political, economic and social development of the American people from the end of Reconstruction to the present.

HIST H102—AMERICAN HISTORY—3 cr. (3 and 0)
Continuation of Hist H101.

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* On leave.

HIST 171—WESTERN CIVILIZATION—3 cr. (3 and 0)
The political, economic, and social movements of Western Civilization from ancient times to A.D. 900.

HIST 172—WESTERN CIVILIZATION—3 cr. (3 and 0)
The political, economic and social movements of Western Civilization from A.D. 900 to 1715.

HIST H172—WESTERN CIVILIZATION—3 cr. (3 and 0)
Same as Hist 172 except that this honors section is open to students only by invitation.

HIST 173—WESTERN CIVILIZATION—3 cr. (3 and 0)
The political, economic, and social movements of Western Civilization from 1715 to the present.

HIST H173—WESTERN CIVILIZATION—3 cr. (3 and 0)
Same as Hist 173 except that this honors section is open to students only by invitation.

HIST 306—AMERICAN ECONOMIC DEVELOPMENT—3 cr. (3 and 0)
The history of the economic development of the United States from 1492 to the present with emphasis on agriculture, transportation, banking, commerce, economic policies of the national government, and particularly the industrial revolutions. *Prerequisite:* Hist 101 and 102.

HIST 307—RECENT U. S. DIPLOMATIC HISTORY—3 cr. (3 and 0)
The history of American foreign policy from the late 19th century to the present, showing the rise of America's world interests and gradual involvement in global affairs. Emphasis is placed on the role of public opinion in foreign policy. Not open to students who have taken Hist 413. *Prerequisite:* Hist 101, 102.

HIST 313—HISTORY OF SOUTH CAROLINA—3 cr. (3 and 0)
The political, economic and social development of South Carolina from 1670 up to the present. *Prerequisite:* Junior standing.

HIST 314—HISTORY OF THE SOUTH—3 cr. (3 and 0)
Origins and development of political, economic, and cultural institutions of the South from the Colonial period to the present; and the role of the South in the nation's development. (Formerly Hist 403.)

HIST 315—BLACK HISTORY IN AMERICA—3 cr. (3 and 0)
This course is an effort to define and understand the relationship of Black Americans with White Americans within American society after 1619. *Prerequisite:* Permission of the instructor.

HIST 331—PRE-MODERN HISTORY OF EAST ASIA—3 cr. (3 and 0)
A survey of the history of China and Japan from earliest times to the arrival of Europeans in the sixteenth century.

HIST 332—MODERNIZATION OF EAST ASIA—3 cr. (3 and 0)
A survey of the history of China and Japan from the Sixteenth Century to the present, with emphasis on the impact of Western culture.

HIST 340—INDIGENOUS AND COLONIAL LATIN AMERICA—3 cr. (3 and 0)
An introduction to the geography of the region; structure and accomplishments of pre-Columbian societies; Iberian background to overseas expansion;

conquest and settlement of the New World; political, economic, and social patterns in the colonial era leading to the Wars of Independence. *Prerequisite:* Junior standing or permission of the instructor.

HIST 341—MEXICO, CENTRAL AMERICA, AND THE CARIBBEAN SINCE 1800—3 cr. (3 and 0)

An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 342—SOUTH AMERICA SINCE 1800—3 cr. (3 and 0)

An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 361—HISTORY OF ENGLAND TO 1603—3 cr. (3 and 0)

The history of England to 1603. *Prerequisite:* Junior standing.

HIST 363—HISTORY OF ENGLAND SINCE 1603—3 cr. (3 and 0)

A continuation of History 361. *Prerequisite:* Junior standing.

HIST 371—ANCIENT CIVILIZATION—3 cr. (3 and 0)

A survey of the history of the Near East, Greece, and Rome to A.D. 476. *Prerequisite:* Hist 171, 172. (Formerly Hist 310.)

HIST 385—HISTORY OF RUSSIA TO 1905—3 cr. (3 and 0)

A survey of Russian history from earliest times to 1905, emphasizing Kievan and Appanage Russia, the rise of the Moscow state, and Imperial Russia. *Prerequisite:* Junior standing.

HIST 386—HISTORY OF RUSSIA SINCE 1905—3 cr. (3 and 0)

Continuation of Hist 385. *Prerequisite:* Junior standing.

HIST 410—HISTORY OF COLONIAL AMERICA—3 cr. (3 and 0)

The development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards, and the philosophy of, the American revolution. *Prerequisite:* Hist 101, 102.

HIST 411—UNITED STATES, 1783-1850—3 cr. (3 and 0)

The formation and growing pains of the new nation through the Federal and Middle periods of its history, with emphasis on economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism. *Prerequisite:* Hist 101, 102.

HIST 412—UNITED STATES, 1850-1900—3 cr. (3 and 0)

A course dealing with the background causes of developments during, and broad problems after, the Civil War in American history. *Prerequisite:* Hist 101, 102.

HIST 413—UNITED STATES HISTORY SINCE 1900—3 cr. (3 and 0)

The history of the United States from 1900 to the present. *Prerequisite:* Hist 101, 102.

Hist 473—Medieval History—3 cr. (3 and 0)

A survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life. *Prerequisite:* Hist 172 or permission.

Hist 475—The Renaissance—3 cr. (3 and 0)

An examination of the transitional period of European civilization (ca. 1300-1500) with emphasis on institutional, cultural, and intellectual developments. *Prerequisite:* Hist 172 or permission.

Hist 476—Early Modern Europe—3 cr. (3 and 0)

The evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion, and growth of nation-states. The study will include intellectual advances and the beginnings of European expansion overseas. *Prerequisite:* Hist 172 or permission.

Hist 477—Absolutism and the Age of Reason—3 cr. (3 and 0)

A study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the question of French hegemony, and the synthesis of the eighteenth century Enlightenment. *Prerequisite:* Hist 172 or permission.

Hist 479—Europe, 1789-1850—3 cr. (3 and 0)

A history of Europe from the outbreak of the French Revolutions through the Revolutions of 1848, with emphasis on the conflict between the forces of change and those of conservatism within the states and in Europe in general. (Formerly Hist 356.) *Prerequisite:* Hist 173 or permission.

Hist 480—Europe, 1850-1914—3 cr. (3 and 0)

A history of Europe from the mid-nineteenth century to the outbreak of the First World War, with emphasis on the social, economic and political development of the European states and the forces of nationalism, imperialism, and liberalism. (Formerly Hist 357.) *Prerequisite:* Hist 173 or permission.

Hist 481—Nineteenth Century European Diplomacy, 1815-1914—3 cr. (3 and 0)

A study of 19th century European diplomacy from the Congress of Vienna to the outbreak of the First World War, with emphasis on the functioning of the Concert System, the effects of nationalism, industrialism, popular democracy and imperialism on the character of diplomacy and the relations of the Great Powers. *Prerequisite:* Hist 172, 173.

Hist 482—International Relations Since 1914—3 cr. (3 and 0)

The great powers and world politics since 1914. *Prerequisite:* Hist 173 or permission.

Hist 483—Europe in the Twentieth Century—3 cr. (3 and 0)

A study of the political, economic, and social institutions of the European peoples from 1914 to the present. Attention will be given to the world wars and to the collapse of the European state-system.

Hist 484—European Intellectual History Since 1789—3 cr. (3 and 0)

A survey, based upon representative works, of the major intellectual currents in Europe from the Enlightenment to the present. *Prerequisite:* Hist 173 or permission.

HIST 499—STUDIES IN HISTORY—3 cr. (3 and 0)

An attempt to integrate the students' knowledge and understanding of the field of history by lectures, discussions, and readings on the broad themes of history and their relevance to particular periods and geographical areas. Required of all history majors. *Prerequisite:* Hist 101, 102, 172, 173, and permission of the history adviser.

HIST 610—HISTORY OF COLONIAL AMERICA—3 cr. (3 and 0)

HIST 611—UNITED STATES, 1783-1850—3 cr. (3 and 0)

HIST 612—UNITED STATES, 1850-1900—3 cr. (3 and 0)

HIST 613—UNITED STATES SINCE 1900—3 cr. (3 and 0)

HIST 673—MEDIEVAL HISTORY—3 cr. (3 and 0)
(Formerly Hist 702)

HIST 675—THE RENAISSANCE—3 cr. (3 and 0)
(Formerly Hist 704)

HIST 679—EUROPE, 1789-1850—3 cr. (3 and 0)
(Formerly Hist 356)

HIST 680—EUROPE, 1850-1914—3 cr. (3 and 0)
(Formerly Hist 357)

HIST 682—INTERNATIONAL RELATIONS SINCE 1914—3 cr. (3 and 0)

HIST 807—UNITED STATES DIPLOMATIC HISTORY SINCE 1877—3 cr. (3 and 0)

HIST 811—INTRODUCTION TO HISTORICAL RESEARCH—3 cr. (3 and 0)

HIST 812—UNITED STATES HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 813—MEDIEVAL HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 814—MODERN EUROPEAN HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 824—SEMINAR IN THE AMERICAN SOUTH—3 cr. (3 and 0)

HIST 825—SEMINAR IN THE CIVIL WAR AND RECONSTRUCTION—3 cr. (3 and 0)

HIST 861—SEMINAR IN MEDIEVAL ENGLAND—3 cr. (3 and 0)

HIST 862—SEMINAR IN MEDIEVAL ENGLAND TO 1485—3 cr. (3 and 0)

HIST 863—SEMINAR IN TUDOR ENGLAND—3 cr. (3 and 0)

HIST 864—SEMINAR IN STUART ENGLAND—3 cr. (3 and 0)

HIST 865—SEMINAR IN MODERN ENGLAND SINCE 1715—3 cr. (3 and 0)

HIST 866—SEMINAR IN MODERN ENGLAND SINCE 1715—3 cr. (3 and 0)

HIST 891—RESEARCH—Credit to be arranged.

HORTICULTURE

Professors: L. O. Van Blaricom, W. L. Ogle, T. L. Senn, *Head*

Associate Professors: J. R. Haun, H. J. Sefick, E. T. Sims, Jr., B. J. Skelton, G. E. Stembridge, F. W. Thode

Assistant Professors: J. P. Fulmer, C. R. Johnson, W. S. Jordan, F. B. Ledeboer

Hort 201—General Horticulture—3 cr. (2 and 2) F, S

A working knowledge of the fundamental plant processes is developed, showing the influence of light, temperature, water and nutrients upon vegetative growth and reproduction of horticultural plants. Production practices, harvesting, storage and marketing of the principal fruit, vegetable and ornamental crops are discussed with demonstrations and practice in greenhouse and orchard. *Prerequisite:* Bot 102 and Ch 101.

Hort 302—Principles of Vegetable Production—3 cr. (2 and 3) F

The general principles of vegetable growing and handling. Phases receiving special emphasis are economic importance, producing areas, management practices, plant forcing, cultural practices, irrigation, quality factors, harvesting, grading, packing, storage, market inspection, transportation, refrigeration, exhibition and seed production. *Prerequisite:* Hort 201.

Hort 303—Plant Materials I—3 cr. (2 and 3) F

Woody, ornamental plants and their aesthetic and functional uses in landscape developments. The study covers habit of growth, ultimate size, texture effect, period of bloom, color, and cultural requirements.

Hort 304—Plant Materials II—3 cr. (2 and 3) S

Herbaceous, ornamental plants which are commonly used as garden flowers. This study covers habit of growth, size, period of bloom, color and cultural requirements.

Hort 305—Plant Propagation—3 cr. (2 and 3) F

Methods of propagation; time, manner and material for making cuttings; temperature and media for rooting cuttings or ornamental trees, shrubs and flowering plants; propagating structures, soils and fertilizers. Practical instruction given in field and greenhouse. *Prerequisite:* Hort 201.

Hort 308—Landscape Design—3 cr. (2 and 3) S

Landscape planning of residential and public properties in order to achieve best use and most enjoyment from a given piece of ground. *Prerequisite:* Hort 303.

Hort 310—Floriculture—3 cr. (2 and 3) S

Greenhouse production of commercial flower crops; soils; fertilizers; greenhouse diseases and insects; flower crops to be grown on benches and as pot plants; marketing and costs of production. *Prerequisite:* Hort 201.

Hort 352—Commercial Pomology—3 cr. (2 and 3) F

Fruit bud formation, rest period and water relations of fruit plants, soils, fruit setting; orchard soil management and responses of various fruits to fertilizers; principles of pruning, effect of climatic differences, freezing of tissues and means of avoiding injury; harvesting, transportation and storage. *Prerequisite:* Hort 201.

HORT 405—NUT TREE CULTURE—2 cr. (2 and 0) F, '72 and alternate years.
The production, harvesting and marketing of the principal nut crops with emphasis on the pecan. *Prerequisite:* Hort 201.

HORT 406—NURSERY TECHNOLOGY—3 cr. (2 and 3) S
Principles and techniques in handling nursery crops. *Prerequisite:* Hort 303 and Hort 305.

HORT 407—LANDSCAPE DESIGN—3 cr. (2 and 3) F
The first half of this course is a study of trees, shrubs, vines and ground covers used in landscape planting. Attention is given to cultural requirements, growth habits, period of bloom, texture and fall color. The second half of the course is devoted to landscape planning for small residential properties.

HORT 408—FLORAL DESIGN AND RETAIL MARKETING—2 cr. (1 and 3) F
Studies of the retail flower business with relation to financing, floor plan, equipment, personnel, supplies, salesmanship, advertising, and other important areas. Floral designing for the retail trade will include table arrangements, funeral and wedding designs, as well as corsage and wreath construction.

HORT 409—SEMINAR—1 cr. (1 and 0) F
Recent research work on various phases of horticulture, methods of conducting investigations, and preparation of report of investigations.

HORT 410—SEMINAR—1 cr. (1 and 0) S
A continuation of Hort 409.

HORT 412—TURF MANAGEMENT—3 cr. (2 and 3) F
Studies of warm and cool season turfgrasses in relation to regional adaptation, soils, fertilization, general maintenance practices, diseases and insects. Identification of grass and weed species and specific management program for home lawns, golf courses, parks and roadsides. *Prerequisite:* Junior standing.

HORT 451—SMALL FRUIT CULTURE—3 cr. (2 and 3) S
Varieties, soils, sites, culture, fertilizers, harvesting and preparation for marketing of grapes, strawberries, dewberries, blackberries, raspberries and other small fruits. *Prerequisite:* Hot 201.

HORT 456—VEGETABLE CROPS—3 cr. (3 and 0) S, '73 and alternate years.
The principles and practices employed in the commercial growing and marketing of vegetable crops. Emphasis is placed on temperature requirements, plant characteristics, varieties, soils, fertilizers, weed control, harvesting and preparation for mrket.

HORT 460—PROBLEMS IN LANDSCAPE DESIGN—5 cr. (3 and 6) F
Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans, costs; further study of materials used; original problems; field study. *Prerequisite:* Hort 308 or 407.

HORT 464—POST HARVEST HORTICULTURE—3 cr. (2 and 2) F
The handling of fruits, vegetables, and ornamental crops after harvesting. Subjects include spoilage problems, hydrocooling, common and cold storage of crops, packaging and processing procedures.

HORT 468—INTRODUCTION TO RESEARCH—2 cr. (1 and 3) S
Principles, developments and changes in research methods related to certain fields of agricultural research. The students obtain practice in experimental

techniques, scientific writing and the use and maintenance of various research instruments and equipment. *Prerequisite:* Senior standing.

HORT 605—NUT TREE CULTURE—2 cr. (2 and 0)

HORT 606—NURSERY TECHNOLOGY—3 cr. (2 and 3)

HORT 607—LANDSCAPE DESIGN—3 cr. (2 and 3)

HORT 608—FLORAL DESIGN AND RETAIL MARKETING—2 cr. (1 and 3)

HORT 610—FLORICULTURE—3 cr. (2 and 3)

HORT 612—TURF MANAGEMENT—3 cr. (2 and 3)

HORT 651—SMALL FRUIT CULTURE—3 cr. (2 and 3)

HORT 652—COMMERCIAL POMOLOGY—3 cr. (2 and 3)

HORT 656—VEGETABLE CROPS—3 cr. (3 and 0)

HORT 660—PROBLEMS IN LANDSCAPE DESIGN—5 cr. (3 and 6)

HORT 664—POST HARVEST HORTICULTURE—3 cr. (2 and 3)

HORT 668—INTRODUCTION TO RESEARCH—2 cr. (1 and 3)

HORT 801—PROBLEMS IN SMALL FRUIT PRODUCTION—3 cr. (3 and 0)

HORT 802—RESEARCH SYSTEMS IN HORTICULTURE—3 cr. (2 and 3)

HORT 803—EXPERIMENTAL OLERICULTURE—3 cr. (3 and 0)

HORT 804—SCIENTIFIC ADVANCES IN ORNAMENTAL HORTICULTURE—3 cr. (3 an 0)

HORT 805—PHYSICOCHEMICAL PROCEDURES FOR DETERMINING QUALITY IN HORTICULTURAL CROPS—3 cr. (2 and 3)

HORT 806—POST-HARVEST PHYSIOLOGY AND HANDLING OF HORTICULTURE CROPS—3 cr. (3 and 0)

HORT 807—POMOLOGY—3 cr. (3 and 0)

HORT 808—SPECIAL INVESTIGATIONS IN HORTICULTURE—2 cr. (2 and 0)

HORT 809—SEMINAR I—1 cr. (1 and 0)

HORT 810—SEMINAR II—1 cr. (1 and 0)

HORT 811—QUANTITATIVE EXPOSITION OF PLANT DEVELOPMENT—2 cr. (1 and 3)

HORT 891—RESEARCH—Credit to be arranged.

HORT 991—DOCTORAL RESEARCH—Credit to be arranged.

HOSPITAL AND HEALTH SERVICES ADMINISTRATION

Professor: F. A. BURTNER

Associate Professor: C. O. SHULER

Adjunct Professor: R. E. TOOMEY

H ADM 308—HOSPITAL AND HEALTH SERVICES ADMINISTRATION—3 cr. (3 and 0)

An introduction to the organization and operation of modern American hospitals, separate clinics and public health services. Included will be legal status, organizational pecularities, and specific legislation effecting such agencies. *Prerequisite:* Junior standing.

H Adm 410—Hospital Internship—3 cr. (0 and 9)
The student will spend nine hours per week on a specified program of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. The course will be specifically outlined along with the amount of time the student will spend in each phase or department of the hospital. Student progress will be constantly monitored by University faculty and hospital staff. *Prerequisite:* H Adm 308.

H Adm 610—Hospital Internship—3 cr. (0 and 9)
The student will spend approximately nine hours per week following a detailed plan of study consisting of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. Progress will be periodically evaluated by University and hospital staffs.

H Adm 800—The Function and Organization of Hospitals and Health Services Administration—3 cr. (3 and 0)
An overview of organization, function, place in the community and society of hospitals, individual health services and public health services. This course in conjunction with an administrative internship will prepare the student for major responsibilities in the area of health service administration.

HUMANITIES

Hum 201—Introduction to the Humanities—3 cr. (3 and 0)
A general introduction to humanistic studies, stressing the interrelatedness of various humanistic disciplines. Such fields as art, architecture, music, literature, philosophy, and drama will be considered as they interact with, support, and develop each other in various cultural settings.

Hum 202—Introduction to the Humanities—3 cr. (3 and 0)
A continuation of Hum 201. *Prerequisite:* Hum 201.

Hum 203—Critical Judgment of the Cinema—3 cr. (3 and 0)
The historical development of the aims and techniques of the cinema; the theory of cinematography, its artistic values, and its critical standards. *Prerequisite:* Sophomore standing.

INDUSTRIAL EDUCATION

Professor: A. F. Newton, *Head*

Associate Professors: D. E. Maurer, H. E. Morgan, Jr.

Assistant Professors: F. A. Bosdell, P. C. Caley, J. P. Crouch, H. P. Pate, W. E. West

In Ed 101—Introduction to Industrial Education—1 cr. (1 and 0)
An introduction to the field of Industrial Education in terms of the underlying philosophies, the aims and goals, and the specific objectives of each of the Industrial Education options.

In Ed 102—Woodworking I—2 cr. (1 and 3)
A study of wood, its properties and the requisite skills necessary for understanding the use of wood in our technological way of life. *Prerequisite:* In Ed 101.

In Ed 202—Woodworking II—2 cr. (1 and 3)
A continuation of In Ed 102 in the study of wood, its properties, skills in machine and tool use with wood, project design, project costs and finishing processes necessary for teachers of industrial subjects. *Prerequisite:* In Ed 102.

In Ed 203—Basic Metal Processes—3 cr. (1 and 6)
Material separating, forming and combining practices in the metals industries, through the study of basic casting, welding and sheet metal techniques. *Prerequisite:* In Ed 101.

In Ed 204—Graphic Arts—3 cr. (1 and 6)
Major emphasis is placed on the basic principles underlying the graphic arts. Major areas of study include general photography, graphic layout and design, process photography, offset lithography, screen processing printing, and bindery. Modern industrial applications are stressed throughout. *Prerequisite:* In Ed 101.

In Ed 205—Power Technology—3 cr. (2 and 2)
A study of power in terms of energy sources, and the generation, transmission and utilization of power. Emphasis is placed on the development of insights and understandings of the scientific and operational principles involved in the production, transmission, and utilization of power. *Prerequisite:* In Ed 101.

In Ed 220—Recreational and Avocational Crafts—3 cr. (2 and 3)
Provides exploratory experiences in the performance of a variety of arts and crafts activities, and encourages the development of an understanding of the purpose of arts and crafts in the comprehensive recreational program.

In Ed 302—Dwelling Materials and Construction Methods—2 cr. (1 and 2)
This course is designed as an introduction to the commonly used building materials and the methods of combining them in present day construction. *Prerequisite:* In Ed 102.

In Ed 303—Electricity—3 cr. (1 and 6)
A laboratory inquiry into the theory and application of components, circuits, and instrumentation associated within the realm of electricity. *Prerequisite:* In Ed 101.

In Ed 304—Photographic Techniques—3 cr. (1 and 6)
Emphasis is placed on applications of black and white and color photography as activities for vocation and avocation. Sufficient laboratory experiences are provided to assure confidence in the use of photographic techniques. The tools and materials of image preparation are also used in conjunction with several graphic reproduction processes to enrich the effectiveness of visual presentations. Problems encountered in action, portrait, still-life, and character study photography are considered.

In Ed 305—Machining Practices—3 cr. (1 and 6)
Basic practical shop experiences on the lathe, drill press, milling machine and shaper. Benchwork, measuring tools, theory and demonstrations related to a survey of fundamental machining practices. *Prerequisite:* In Ed 101.

In Ed 310—Methods of Trade Teaching—3 cr. (3 and 0)
This course is designed to give basic instruction to beginning teachers in trade work. Psychological factors of learning; individual differences; methods

of teaching subjects; the special methods used in teaching skills; grading of students and keeping of proper records and reports. (Offered in Summer Sessions only.)

In Ed 312—Metal Processes in the General Shop—3 cr. (3 and 0)
Major emphasis is placed on planning and development of projects in wrought iron, sheet metal, art metal, metal spinning, welding, heat treating and other aspects of metal work that fit into a general shop program. (Offered in Summer Sessions only.)

In Ed 313—Arts and Crafts—3 cr. (2 and 3)
Emphasis on knowledge and skills in the industrial crafts by lecture, discussion and laboratory experiences. Stress is placed on several crafts basic to industrial production and popularity. Laboratory experience is required in at least four craft areas with an additional experience in one minor craft.

In Ed 314—Basic Electronics—3 cr. (1 and 6)
Basic principles of electronics as applied in radio, television, and automatic controls involving vacuum tubes, semiconductors, integrated circuits, and other electronic devices and materials. *Prerequisite:* In Ed 303.

In Ed 315—Construction Practices—3 cr. (3 and 0)
This course is a study of industrial practices commonly employed in the construction industry. Included will be the use of brick, tile, concrete, metal, wood, and other construction materials. (Offered in Summer Sessions only.)

In Ed 316—Plastics and Plastic Processes in the General Shop—3 cr. (3 and 0)
The industrial, commercial and personal uses of plastics are discussed and demonstrated. In addition, the kinds of plastics, their properties, and special uses are studied. (Offered in Summer Sessions only.)

In Ed 318—Industrial Technology Techniques—3 cr. (3 and 0)
Major emphasis is placed on casting, stamping and forming processes, forging and extrusion processes, machining processes, metal spraying or metallurgy, blast cutting, heating and case hardening, assembly processes, bending, finishing processes, inspection gaging. (Offered in Summer Sessions only.)

In Ed 320—Machine Woodworking—2 cr. (1 and 3)
Basic characteristics of woodcutting, shaping, and finishing operations by use of machinery and auxiliary tools. Includes project work. *Prerequisite:* Junior standing. (Not for Industrial Education Students.)

In Ed 325—Industrial Organizations and People—3 cr. (3 and 0)
A study of the relationships of personnel to the kinds of tasks they are asked to perform in industrial situations and the ways such situations affect workers. Emphasis is placed on methods of personnel, organization, evaluation, working conditions, and safety.

In Ed 333—Design—3 cr. (2 and 2)
The study of the principles of form and design elements in two or three dimensions as related to products in the several industrial arts areas. Lectures and laboratory projects stress creativity in the use of materials in reaching design solutions and in developing a personal design philosophy. Limited market and engineering research is conducted along with the study of significant figures in the field. *Prerequisite:* Basic courses in laboratory methods.

IN ED 350—INDUSTRIAL COOPERATIVE EXPERIENCE—6 cr.

A full-time work experience program in industry for industrial vocational-technical education degree candidates. The student, under the cooperative supervision of the University instructor and an industrial supervisor, is placed in industry to receive planned experiences in the technical specialty which he is preparing to teach. The University instructor will coordinate placement, supervision, and evaluation of the student. The course is offered during the summer only and students are required to register with the instructor one semester prior to the summer in which he plans to enroll. *Prerequisite:* Junior standing in the industrial vocational-technical education program and approval of the instructor.

IN ED 372—ARTS AND CRAFTS FOR THE ELEMENTARY CHILD—3 cr. (2 and 3)

Provides the elementary teacher with an opportunity to develop skills and knowledge in the use of a variety of media suitable for integrating the study of industry and industrial technology into the usual classroom procedures.

IN ED 402—DIRECTED TEACHING—6 cr. (0 and 18)

Supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for securing experience in teaching industrial subjects. *Prerequisite:* In Ed 416, 425, and grade-point ratio required for graduation.

IN ED 405—COURSE ORGANIZATION AND EVALUATION—3 cr. (3 and 0)

Problems, techniques and procedures in the preparation, selection and organization of subject matter for instructional purposes. Methods, techniques and preparation of materials used in the evaluation of student achievement in industrial education subjects.

IN ED 408—TRAINING PROGRAMS IN INDUSTRY—3 cr. (3 and 0)

Basic concepts of supervision, administration, and management of training programs. Emphasis on determining training requirements, planning, directing, and evaluating training programs.

IN ED 416—DESIGN AND OPERATION OF INDUSTRIAL EDUCATION LABORATORIES—3 cr. (2 and 2)

This course deals with laboratory design requirements of unit laboratories as well as multi-activity laboratories. Selection and procurement of tools and equipment, budgeting management and the coordination of activities in the laboratory are considered. *Prerequisite:* In Ed 313.

IN ED 421—VOCATIONAL COOPERATIVE PROGRAMS—2 cr. (2 and 0)

A study of the developments, objectives and principles of industrial cooperative training programs. Emphasis is on the organization, promotion, and management of programs in this area of vocational education.

IN ED 422—HISTORY AND PHILOSOPHY OF INDUSTRIAL AND VOCATIONAL EDUCATION—3 cr. (3 and 0)

A study of industrial and vocational education programs with the intent of developing a sound individual philosophy of industrial and vocational education. General topics covered: history; local, state, and federal legislation; types of vocational-technical programs; professional organizations; manpower utilization, vocational guidance, and training; industry, labor, and school relationships.

In Ed 425—Teaching Industrial Subjects—3 cr. (3 and 0)
Effective methods and techniques of teaching industrial subjects. Emphasis is given to class organization, preparation of lesson outlines, and audio-visual aids. *Prerequisite:* Ed 335.

In Ed 432—Advanced Woodworking—2 cr. (1 and 3)
An advanced consideration of machine methods and developments, materials, quality factors, and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 102, In Ed 202.

In Ed 435—Advanced Welding—2 cr. (1 and 3)
An advanced consideration of studies originated in In Ed 203, new theories and developments in welding technology. Inspection trips, written and oral reports. *Prerequisite:* In Ed 203.

In Ed 436—Advanced Material Forming—2 cr. (1 and 3)
Advanced consideration of studies initiated in In Ed 203, development and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 203.

In Ed 438—Advanced Machining—2 cr. (0 and 6)
Advanced experiences in the set-up, operation and maintenance of machine tools and equipment. Project and product design. Study and reports of recent machining technological developments. *Prerequisite:* In Ed 305.

In Ed 440—Advanced Techniques of the Graphic Arts—3 cr. (1 and 6)
Students selecting to pursue the area of graphic arts will gain experience in the development of advanced techniques of layout and design; photographic copy preparation; cold type composition; line, halftone, duotone, and special effects photography, and advanced platemaking and pressmanship.

In Ed 441—Comprehensive General Shop Practices—2 cr. (2 and 0)
This course deals with the problems in the administration of the multiple activity programs in the comprehensive laboratory. Consideration and planning of multi-activity laboratory programs of instruction for the secondary schools is the major focus. *Prerequisite:* In Ed 313.

In Ed 442—Competency Testing in Vocational Subjects—3 cr. (3 and 0)
This course is especially designed for trade teachers who have assisted in making trade tests for S. C. Certification program. Teachers who expect to assist in making trade tests are also urged to enroll in this course. The course is devoted to revising present trade tests and developing tests in new fields. (Offered in Summer Sessions only.)

In Ed 444—Graphic Arts Production Control—3 cr. (2 and 3)
A study of commercial and industrial printing control. Emphasis is placed upon considerations for decision making in the areas of process and equipment selection, capital investment, and plant layout. Other topics include production flow, cost analysis, personnel supervision and training, and recent developments as they affect production. *Prerequisites:* In Ed 204, In Ed 440, and permission of the instructor.

In Ed 450—Industrial Cooperative Experience—6 cr.
Continuation of In Ed 350. Summer only. *Prerequisite:* Senior standing, In Ed 350, and approval of the instructor.

IN ED 451—SPECIAL PROJECTS—3 cr. (3 and 0)
The student is assigned a project in accordance with his needs and capabilities. Projects are either experimental, theoretical or developmental and cover subjects not thoroughly covered in other courses.

IN ED 496—PUBLIC RELATIONS—3 cr. (3 and 0)
This course emphasizes the techniques and methods of effective public and industrial relations which contribute to understanding and cooperation of labor, business, professional, educational, and industrial groups.

IN ED 605—COURSE ORGANIZATION AND EVALUATION—3 cr. (3 and 0)

IN ED 608—TRAINING PROGRAMS IN INDUSTRY—3 cr. (3 and 0)

IN ED 616—DESIGN AND OPERATION OF INDUSTRIAL EDUCATION LABORATORIES—3 cr. (2 and 2)

IN ED 622—HISTORY AND PHILOSOPHY OF INDUSTRIAL AND VOCATIONAL EDUCATION—3 cr. (3 and 0)

IN ED 625—TEACHING INDUSTRIAL SUBJECTS—3 cr. (3 and 0)

IN ED 632—ADVANCED WOODWORKING—2 cr. (1 and 3)

IN ED 635—ADVANCED WELDING—2 cr. (1 and 3)

IN ED 636—ADVANCED MATERIAL FORMING—2 cr. (1 and 3)

IN ED 638—ADVANCED MACHINING—2 cr. (1 and 3)

IN ED 640—ADVANCED TECHNIQUES OF THE GRAPHIC ARTS—3 cr. (1 and 6)

IN ED 641—COMPREHENSIVE GENERAL SHOP PRACTICES—2 cr. (2 and 0)

IN ED 644—GRAPHIC ARTS PRODUCTION CONTROL—3 cr. (2 and 3)

IN ED 696—PUBLIC RELATIONS—3 cr. (3 and 0)

IN ED 815—SEMINAR IN INDUSTRIAL EDUCATION—1 cr. (1 and 0)

IN ED 820—RECENT PROCESS DEVELOPMENTS—3 cr. (3 and 0)

IN ED 840—SCHOOL SHOP DESIGN—3 cr. (3 and 0)

IN ED 845—CURRICULUM DEVELOPMENT IN INDUSTRIAL EDUCATION—3 cr. (3 and 0)

IN ED 860—CURRICULUM PLANNING AND DEVELOPMENT IN INDUSTRIAL ARTS—3 cr. (3 and 0)

IN ED 861—ADMINISTRATION AND SUPERVISION OF VOCATIONAL EDUCATION—3 cr. (3 and 0)

IN ED 865—AMERICAN INDUSTRIES—3 cr. (3 and 0)

IN ED 891—RESEARCH IN INDUSTRIAL EDUCATION— Credit to be arranged.

IN ED 895—SPECIAL PROBLEMS I—3 cr. (3 and 0)

IN ED 896—SPECIAL PROBLEMS II—3 cr. (3 and 0)

INDUSTRIAL ENGINEERING

Professor: E. Laitala, *Head*

Associate Professor: J. H. Couch

IE 301—Process Planning I—3 cr. (2 and 3)

Study of methods of conversion of raw materials into finished products. Emphasis is from the viewpoint of management and control of manufacturing operations. Includes basic terminology, interpretation and use of engineering plans, impact of production volume. This course will examine various manufacturing processes including material removal, casting, joining and forming of materials, and associated measurement techniques. *Prerequisite:* EG 103 or 109 and Phys 122.

IE 303—Job Evaluation and Wage Incentives—3 cr. (3 and 0)

Job description, specification, and classification. Systems employed for establishing relative ranks of jobs. Basic wage and salary determination. Wage incentive methods. *Prerequisite:* IE 307, 410 or consent of instructor.

IE 304—Methods and Standards—3 cr. (2 and 3)

Fundamentals relating to work methods design and analysis. Includes study of techniques necessary for determining efficient work methods. Work measurement as a basis for control of costs and scheduling. *Prerequisite:* Junior standing.

IE 306—Process Planning II—3 cr. (2 and 3)

Study of recent process developments and impact on planning and control of manufacturing operations. Numerical control of machines, computer-aided design, zero defects program, and others. Special laboratory investigations, and value engineering project. *Prerequisite:* IE 301.

IE 307—Survey of Engineering—3 cr. (3 and 0)

An examination of engineering in terms of fundamentals employed, criteria governing engineering decisions, basic functions, and plans created. The kinds of interactions and interdependencies between engineering and non-engineering functions are identified as a basis for optimum organization design. Open to students planning employment in industry including both engineering and non-engineering majors. *Prerequisite:* Phys 208 or 221 and junior standing.

IE 403—Process Planning III—3 cr. (3 and 0)

Continuation of IE 306; study of latest process developments. *Prerequisite:* IE 306.

IE 405—Plant Layout and Material Handling—3 cr. (2 and 3)

Fundamentals underlying the planning of factory layout for new products and increases in production volume. Layout by product and process. Scale model, template, and other planning techniques. Materials handling analysis and equipment decisions. *Prerequisite:* IE 301 and IM 408 or consent of instructor.

IE 407—Industrial Application of Statistics—3 cr. (2 and 3)

Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability analysis, and machine interference. *Prerequisite:* Math 208 and Math 301.

IE 408—Plant Design—2 cr. (1 and 3)
Integration of unit operations into a total production system. Study of analytical procedures for determining layout of production and other facilities, line balance, manner in which operations shall be linked or material moved between them. Creation and analysis of alternative designs. *Prerequisite:* IE 304 and Senior standing.

IE 410—Engineering and Organization—3 cr. (3 and 0)
The nature of industrial enterprise in terms of purpose, organization structure, governing criteria, responsibilities and relationships of various functional groups. Project engineering and organization. Analysis and coordination of engineering functions as foundation for engineering management.

IE 412—Seminar—1 cr. (1 and 0)
Library search and oral reports covering recent technological developments in the field of industrial engineering. Consideration of professional responsibilities and post graduation plans. A major term paper is required. *Prerequisite:* Senior standing in Industrial Engineering.

IE 413—Seminar—1 cr. (1 and 0)
Continuation of IE 412. *Prerequisite:* IE 412.

IE 610—Engineering and Organization—3 cr. (3 and 0)

INDUSTRIAL MANAGEMENT

Professors: C. C. Davis, B. J. Todd, C. H. Whitehurst, Jr., *Head*

Associate Professors: E. A. LaRoche, F. R. Gray, J. L. Richardson, G. D. Riggs, C. O. Shuler, C. R. Smith, J. M. Wannamaker

Assistant Professors: R. W. Barron, Susan H. Brown, C. L. Dyer, T. H. Gunter, Jr., D. M. Swanson, J. A. Turner, R. F. Zant

Instructor: B. M. White

Adjunct Professors: R. E. Toomey, R. L. Brown

IM 100—Introduction to Industrial Management—0 cr. (1 and 0)
A series of lectures by University and industry speakers in which the role of the industrial manager in society is examined and explained. Particular emphasis is placed on orienting the student to understanding the manager's function in a market system economy.

IM 201—Introduction to Industrial Management—3 cr. (3 and 0)
An introductory survey of management's role as a fourth factor of economic production.

IM 299—Computer Programming I—1 cr. (0 and 3)
An elementary operating course primarily designed to familiarize the student with the various capabilities of electronic computers. A demonstrated ability to write basic programs applicable to management areas is required. *Prerequisite:* Permission of instructor.

IM 304—Quality Control—3 cr. (3 and 0)
Basic control techniques in the field of industrial production, inspection and experimentation. Various sampling, control and inspection problems are studied

with special reference to practical applications. Underlying theory, assumptions and limitations are presented. *Prerequisite:* Math 301.

IM 306—CORPORATION FINANCE—3 cr. (3 and 0)
The organization and operation of corporations with emphasis on the nature and influences of the various sources of funds. *Prerequisite:* Junior standing.

IM 307—PERSONNEL MANAGEMENT—3 cr. (3 and 0)
An introductory course dealing with the principles and policies governing present day employee-employer relationships. Attention directed to methods of electing, training, placing, and promoting of employees to develop sound personnel techniques. *Prerequisite:* Junior standing.

IM 308—MARKETING STRATEGY—3 cr. (3 and 0)
This course is designed to explore the development of current marketing concepts and their use in a strategic business situation. Emphasis is placed upon the qualitative aspects of promotional strategy, product design and development, concept testing, methods of distribution, and pricing. The student is introduced to the controllable and uncontrollable variables in marketing and begins to develop an understanding of how each may be used to best advantage in a competitive situation.

IM 312—COMMERCIAL LAW—3 cr. (3 and 0)
An introduction to business law with primary attention given to contracts, agency, negotiable instruments and sales. *Prerequisite:* Junior standing.

IM 313—COMMERCIAL LAW—3 cr. (3 and 0)
Continuation of IM 312 with emphasis on business organization, personal and real property, estates and bankruptcy and security services.

IM 322—LEGAL ENVIRONMENT OF BUSINESS—3 cr. (3 and 0)
A comprehensive study of the development of governmental regulation of business including both state and national regulations. Attention is given to the constitutional source and limitation of power in both governments; specific areas in which the governments have acted (production, labor, combinations, prices, etc.) and the regulations that have been imposed in these areas; and the scope of the administrative process.

IM 401—MARKETING ANALYSIS I—3 cr. (3 and 0)
An examination of the activities involved in the flow of goods and services from producer to consumer. Stressed will be the application of quantitative techniques for predicting sales and evaluating alternative promotional strategies. *Prerequisite:* Senior standing in IM or permission of instructor.

IM 402—OPERATIONS PLANNING AND CONTROL—3 cr. (3 and 0)
The application of modern statistical and mathematical techniques to the planning and control of industrial operations. Emphasis will be placed on applications in forecasting, inventory, production scheduling and control, equipment selection and replacement, maintenance and materials handling. *Prerequisite:* IM 304 and senior standing.

IM 403—SPECIAL PROBLEMS—2 cr. (2 and 0)
Each student will plan and develop a research project related to the field of management. *Prerequisite:* Senior standing in Industrial Management.

IM 404—Managerial Economics—3 cr. (3 and 0)
The objective of this course is to bridge the gap between theory and managerial practices. Its stress is on the use of tools of economic analysis in classifying problems, in organizing and evaluating information, and in comparing alternative courses of action. *Prerequisite:* Mgt Sc 311, or permission of instructor.

IM 405—Economics of Transportation—3 cr. (3 and 0)
History and structure of transportation systems of the United States; the nature of transportation costs and rates. Transportation systems as factors in industrial location. Government policy towards transportation. *Prerequisite:* Senior standing and permission of the instructor.

IM 406—Theory of Industrial Location—3 cr. (3 and 0)
A theoretical study of the general factors which determine plant location in a capitalist society. Particular attention is paid to surveying current literature. A comparison of location theory and actual location patterns is stressed. *Prerequisite:* Senior standing and permission of instructor.

IM 407—Directed Research—1 cr. (1 and 0)
Each student will plan and develop a research project related to the field of management. *Prerequisite:* Senior standing in Industrial Management.

IM 408—Work Simplification and Standardization—3 cr. (2 and 3)
Principles and practices of motion and time as it is applied to industry. Emphasis is given to its application and its influence on methods, material handling, plant layout, and time study procedures.

IM 409—Management Simulation—0-1 cr. (0 and 3)
Practice in managerial decision-making under simulated competitive industry conditions. Guidance is furnishesd by the staff member administering the requirement. The model is designed to derive maximum benefit from previous courses in economics, econometrics and statistics. *Prerequisite:* Senior standing and permission of instructor.

IM 410—Marketing Research I—1 cr. (1 and 0)
A directed research course oriented toward those students interested in a career in marketing.

IM 411—Marketing Research—2 cr. (2 and 0)
A directed research course oriented toward those students interested in a career in marketing.

IM 412—Marketing Analysis II—3 cr. (3 and 0)
A continuation of Marketing Analysis, IM 401. *Prerequisite:* IM 308 or permission of instructor.

IM 413—Marketing Communications—3 cr. (3 and 0)
The vital role of advertising and public relations in today's marketing strategy is examined. Promotional mixes will be designed so as to be a blend of the markets, media, and messages by which corporate communications are maintained with buyers. Communications theory is explored and then the communications process is analyzed with emphasis on its effect upon the flow of goods and services to the consuming public. *Prerequisite:* IM 308.

IM 415—Managerial Decision Making—3 cr. (3 and 0)
Management problems and methods involved in the operation of manufacturing institutions, including location, equipment investment, organization structure, and budgets. Attention is given primarily to the above areas by the use of the case method. Emphasis on oral and written communication. *Prerequisite:* Permission of instructor.

IM 416—Management of Human Resources—3 cr. (3 and 0)
A course designed to orient the student toward recent developments in enlightened uses of human resources with emphasis on procurement, training, development, rewarding and retention of such resources. *Prerequisite:* Permission of instructor.

IM 417—Manufacturing Logistics—3 cr. (3 and 0)
A study of more advanced manufacturing and production techniques including predetermined motion time data systems, micromotion study analysis, work sampling or ratio delay studies, zero defects, materials handling techniques, machine interference, time study formula construction, machinery and equipment replacement calculations, economic lot size determination, development and use of standard data, cost reduction programs, operator training methods, charting of time study data, problems of machinery and equipment layout, and developing of complex time standards. *Prerequisite:* IM 408 or permission of instructor.

IM 418—Management Information Systems—3 cr. (3 and 0)
A study of the design and use of communication processes in which data are recorded, transmitted and revised as an aid in management decision making in operations planning and controlling.

IM 420—Management of Defense Expenditures—3 cr. (3 and 0)
Examines the various components and budget classifications of the Department of Defense. Responsibility for the management of these expenditures and methods employed are treated extensively. *Prerequisite:* Econ 419, Economics of Defense, or permission of instructor.

IM 499—Computer Programming II—1 cr. (0 and 3)
Each student will complete a research project relating to the accomplishment of some management function in which a computer program is now—or is expected to be—of cardinal importance. *Prerequisite:* IM 299 or equivalent.

IM 601—Marketing Analysis I—3 cr. (3 and 0)

IM 602—Operations Planning and Control—3 cr. (3 and 0)

IM 604—Managerial Economics—3 cr. (3 and 0)

IM 605—Economics of Transportation—3 cr. (3 and 0)

IM 606—Theory of Industrial Location—3 cr. (3 and 0)

IM 608—Work Simplification and Standardization—3 cr. (2 and 3)

IM 612—Marketing Analysis II—3 cr. (3 and 0)

IM 615—Managerial Decision Making—3 cr. (3 and 0)

IM 617—Manufacturing Logistics—3 cr. (3 and 0)

IM 620—Management of Defense Expenditures—3 cr. (3 and 0)

MANAGEMENT

MGT 800—MANAGEMENT SIMULATION—1 cr. (0 and 3)

MGT 801—QUANTITATIVE ECONOMIC ANALYSIS—3 cr. (3 and 0)

MGT 802—FINANCE—3 cr. (3 and 0)

MGT 803—OPERATIONS MANAGEMENT—3 cr. (3 and 0)

MGT 804—MANAGERIAL POLICY—3 cr. (3 and 0)

MGT 805—QUALITY CONTROL—3 cr. (3 and 0)

MGT 811—ADVANCED MARKETING ANALYSIS—3 cr. (3 and 0)

MGT 816—MANAGEMENT OF HUMAN RESOURCES—3 cr. (3 and 0)

MGT 891—THESIS—3 cr.

MANAGEMENT SCIENCE

Professors: B. J. TODD, C. H. WHITEHURST

Associate Professors: E. A. LAROCHE, G. D. RIGGS

Assistant Professors: C. L. DYER, D. M. SWANSON, R. F. ZANT

MGT SC 311—INTRODUCTION TO ECONOMETRICS—3 cr. (3 and 0)
An introduction to economic measurement. Emphasis is placed upon the mathematical formulation of economic theory, the application of calculus to economic theory, and the application of statistics with particular emphasis on the use of regression analysis in economics. Elementary econometric models are introduced. *Prerequisite:* Math 301 and Econ 314.

MGT SC 413—MANAGEMENT SCIENCE I—3 cr. (3 and 0)
The role and uses of management science techniques in decision making in business and industry; the problems of internal operation of a business enterprise in static and dynamic settings under conditions of certainty, risk and uncertainty. Deterministic models will be emphasized, and topics include classical optimization, marginal analysis, programming, the transportation problem, allocation and assignment, the game thory. Attention will also be given to input-output, network analysis, and decision theory. *Prerequisite:* Consent of instructor.

MGT SC 414—STATISTICAL ANALYSIS—3 cr. (3 and 0)
This course is designed to provide the student with sufficient understanding of modern statistical methods to make judicious application of statistics in management decision making. Emphasis is placed on the proper design, analysis and interpretation of planned experiences in internal operations. Topics include single factor through fractional factorial experiments, response surface methodology and evolutionary operations. *Prerequisite:* Math 301 or equivalent.

MGT SC 611—INTRODUCTION TO ECONOMETRICS—3 cr. (3 and 0)

MGT SC 613—MANAGEMENT SCIENCE I—3 cr. (3 and 0)

MGT SC 614—STATISTICAL ANALYSIS—3 cr. (3 and 0)

MGT SC 806—REGIONAL SCIENCE METHODS—3 cr. (3 and 0)

MGT SC 807—ECONOMETRIC METHODS I—3 cr. (3 and 0)

MGT SC 808—ECONOMETRIC METHODS II—3 cr. (3 and 0)

MGT SC 812—MANAGEMENT SCIENCE II—3 cr. (3 and 0)

MATERIALS ENGINEERING

Associate Professors: M. J. Eitel, S. F. Hulbert, *Program Coordinator;* J. S. Wolf

Assistant Professors: J. J. Klawitter, J. E. Lemons

MatE 301—Introduction to Metallurgical Engineering—3 cr. (3 and 0)

An introduction to the structure and properties of engineering materials. Topics included are bonding in solids, mechanical behavior, equilibrium and non-equilibrium behavior of mixtures and alloys, material-environment interaction, selection of materials for engineering uses, and analysis of material failures. Emphasis is placed on metals and polymers. *Prerequisite:* Junior standing in engineering or the physical sciences, Ch 102, Phys 221.

MatE 302—Materials Engineering Laboratory—2 cr. (1 and 3)

Laboratory practice in the determination and analysis of the properties of engineering materials. Topics included are specimen selection and preparation, microscopy, photography, temperature measurement, thermal analysis, and mechanical testing. *Prerequisite:* MatE 301 or CrE 310.

MatE 307—Introduction to Polymer Engineering—3 cr. (3 and 0)

An introduction to the materials engineering of organic polymers. Principles and practice of synthesis of macromolecules; polymerization through addition and condensation; copolymerization; block and graft polymerization. Characterization of polymers in solution; molecular weight averages and polymolecularity. Structure and properties of polymers in the condensed state; crystalline-amorphous system; theory of rubber elasticity, mechanical, thermal, optical, and electrical behavior. *Prerequisite:* Freshman Chemistry.

MatE 312—Materials Engineering Thermodynamics—3 cr. (3 and 0)

An introduction to the thermodynamics of materials with special emphasis on metallic systems. Topics included are atomic and crystalline properties of metals, solid solutions and intermetallic compounds, the thermodynamic laws and their relation to solution theory and phase equilibria, and applications of the above to the phase equilibria in unary, binary, and ternary metallic systems with special regard to microstructural evolution. *Prerequisite:* MatE 301 or CrE 310.

MatE 405—Physical Metallurgy I—3 cr. (3 and 0)

A comprehensive treatment of electron theory, lattice defects, diffusion, solutions and phase equilibria, phase transformations, creep and fracture applied to metals and simple alloys, with emphasis on structure-property relationships. *Prerequisite:* MatE 301 or CrE 310.

MatE 406—Physical Metallurgy II—3 cr. (3 and 0)

A continuation of MatE 405. *Prerequisite:* MatE 405.

MatE 408—Principles of Polymer Science I—3 cr. (3 and 0)

An introduction to the materials science of organic polymers. The structures for many types of polymers are surveyed and correlated with macroscopically observable characteristics. The general properties of pure and coexisting polymer phases are defined, and thermally dependent phase transitions are discussed. Further considerations are devoted to swelling phenomena, degradation and stabilization mechanisms, surface modification methods, and to properties of composite structures. *Prerequisite:* MatE 307 or MatE 301 or CrE 310 or an equivalent course.

MatE 409—Principles of Polymer Science II—3 cr. (3 and 0)
A continuation of the introductory course in polymer science. Polymerization methods are surveyed, and the polymerization kinetics of one type of system is dealt with in detail. Quantitative treatments are presented for various experimental procedures that involve dilute polymer solutions. Further considerations are concerned with important testing techniques, and with the unique behavior of some polyelectrolyte systems. *Prerequisite:* MatE 408 or an equivalent course.

MatE 411—Materials Engineering Kinetics—3 cr. (3 and 0)
An introduction to the important rate processes in solid materials. Topics included are homogeneous and heterogeneous phase transitions, solidification and other nucleation processes, recrystallization and grain growth, and sintering reactions. Emphasis is placed upon the effects of these phenomena on the properties of engineering materials. *Prerequisite:* A course in thermodynamics.

MatE 421—Mechanical Metallurgy—3 cr. (3 and 0)
A comprehensive treatment of the concepts of the atomic and microstructural processes which govern the mechanical behavior of metals, alloys, metal oxides, and composite structures. The theories of plastic deformation, creep, and fatigue are applied to metal working processses and the selection of materials for loadbearing applications. *Prerequisite:* MatE 301 or CrE 310.

MatE 450—Special Topics in Materials Engineering—1-3 cr. (1-3 and 0)
A comprehensive study of a topic of current interest in the field of materials engineering. May be taken for credit more than one time. *Prerequisite:* Consent of instructor.

MatE 451—Corrosion of Materials—3 cr. (3 and 0)
An introduction to the aqueous and gaseous corrosion of metals and alloys. Topics included are ion migration in solid and liquid phases, Pourbaix diagrams, theory and application of corrosion rate measurements, and special corrosion process as they apply to metal degradation and failure. *Prerequisite:* A course in thermodynamics.

MatE 620—Mechanical Properties of Materials—3 cr. (3 and 0)

MatE 800—Seminar in Materials Research—1 cr. (1 and 0)

MatE 802—Research Techniques in Physical Metallurgy—3 cr. (2 and 3)

MatE 805—Physical Metallurgy I—3 cr. (3 and 0)

MatE 806—Physical Metallurgy II—3 cr. (3 and 0)

MatE 807—Physical Properties of Polymers—3 cr. (3 and 0)

MatE 808—Mechanical Properties of Polymers—3 cr. (3 and 0)

MatE 810—Diffusion in Solids—3 cr. (3 and 0)

MatE 811—Kinetics of Heterogeneous Reactions—3 cr. (3 and 0)

MatE 812—Metallurgical Thermodynamics—3 cr. (3 and 0)

MatE 814—Surface Chemistry of Materials—3 cr. (3 and 0)

MatE 815—Application of Heterogeneous Equilibria—3 cr. (3 and 0)

MatE 820—Deformation Mechanisms in Solids—3 cr. (3 and 0)

MatE 821—Strength Mechanisms in Solids—3 cr. (3 and 0)

MatE 831—Quantum Theory of Metals I—3 cr. (3 and 0)

MatE 835—X-Ray Metallography—3 cr. (2 and 3)

MatE 841—Sintering and Related Phenomena—3 cr. (3 and 0)

MatE 850—Special Topics in Materials Engineering—3 cr. (3 and 0)

MatE 851—Oxidation of Metals and Alloys—3 cr. (3 and 0)

MatE 891—Research—Credit to be arranged

MatE 991—Doctoral Research—Credit to be arranged

MATHEMATICS

Professors: C. V. Aucoin, F. M. Cholewinski, A. T. Hind, Jr., J. W. Kenelly, *Head;* A. Sobczyk

Associate Professors: K. Alam, M. C. Bell, A. K. Bose, J. V. Brawley, Jr., J. W. Brown, E. C. Coker, Jr., J. L. Flatt, J. C. Harden, Jr., W. R. Hare, Jr., R. E. Haymond, P. T. Holmes, C. E. Kirkwood, Jr., J. W. LaGrone, Renu C. Laskar, S. M. Lukawecki, M. C. Palmer, E. Park, T. G. Proctor, L. A. Rife, W. H. Ruckle, K. Seo, E. L. Stanley, J. R. Sullivan, K. T. Wallenius

Assistant Professors: Claire R. Aucoin, W. R. Boland, P. C. Bowie, A. S. Cover, Sue K. Dunkle, R. E. Fennell, J. D. Fulton, D. R. LaTorre, J. K. Luedeman, J. H. Nicholson, B. J. Prochaska, J. A. Reneke, C. B. Russell

Instructors: Eugenie V. Bartmess,* Louise G. Fulmer, Jeuel G. LaTorre

Math 011—Mathematics—5 cr. (5 and 2)

Basic algebraic methods. A general review and development of fundamental mathematical concepts. Basic numerical processes and techniques of algebra. Designed to prepare students for college courses.

Math 012—Mathematics—5 cr. (5 and 2)

Basic geometric concepts. A general review and development of elementary geometric and spacial concepts. Mensuration formulas and elementary properties of spacial figures. Designed to prepare students for college courses.

Math 100—College Algebra—2 cr. (5 and 0)

Required of all freshmen who fail to make a satisfactory grade on the Mathematics Test, Level I (Standard). An intensified review of high school algebra and the topics listed under Math 103. Students enrolled in Math 100 must receive a passing grade in this course before they are eligible to enroll in any other mathematics course. Math 100 may be substituted for Math 103.

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* On leave.

MATH 101—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)
Topics include: probability spaces, conditional probabilities and discrete random variables. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard) or consent of the instructor.

MATH 102—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
Topics include: intuitive calculus (differentiation and integration), continuous random variables, normal distribution and other probability densities. *Prerequisite:* Math 101 or consent of the instructor.

MATH 103—COLLEGE ALGEBRA—2 cr. (3 and 0)
Algebraic processes, functions, equations, inequalities, mathematical induction, theory of equations, determinants, and logarithms. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard).

MATH 104—TRIGONOMETRY—2 cr. (3 and 0)
Trigonometric functions, equations, identities, and solution of triangles. Logarithms and complex numbers. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard).

MATH 106—CALCULUS OF ONE VARIABLE—4 cr. (5 and 0)
Topics include: analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, techniques of integration, and approximations. *Prerequisite:* Math 103, 104, or a satisfactory score on the Mathematics Test Level I (Standard) or consent of the instructor.

MATH H106—CALCULUS OF ONE VARIABLE—4 cr. (5 and 0)
Same as Math 106 except that this honors section is open to students only by invitation.

MATH 108—CALCULUS AND LINEAR ALGEBRA—4 cr. (5 and 0)
Topics include: matrices and vectors, transformation and matrices, representations of linear transformations and the topics in calculus are infinite series, limits, differentiation and integration. *Prerequisite:* Math 106.

MATH H108—CALCULUS AND LINEAR ALGEBRA—4 cr. (5 and 0)
Same as Math 108 except this honors section is open to students only by invitation.

MATH 115—CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS I—3 cr. (3 and 0)
Logic, sets, and the properties of the counting numbers, numeration systems.

MATH 116—CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS II—3 cr. (3 and 0)
A continuation of Math 115. Subtraction, properties of the integers, elementary number theory, rational number system, real number system. *Prerequisite:* Math 115.

MATH 203—ELEMENTARY STATISTICAL INFERENCE—3 cr. (3 and 0)
A survey course in fundamental statistical principles with applications to social sciences and other fields. The development of the course will assume knowledge of finite probability. Major topics include: empirical frequency distributions, computation of descriptive statistics, basic statistical inference including estimation and z, t, and F tests, regression and correlation analysis, contingency tables, analysis of variance. *Prerequisite:* Math 102 or a 3-credit course in finite probability or consent of the instructor.

MATH 206—CALCULUS OF SEVERAL VARIABLES—4 cr. (5 and 0)
Topics include: real valued functions of several variables, multiple integration, differential calculus of functions of several variables, applications, vector field theory. *Prerequisite:* Math 108.

MATH H206—CALCULUS OF SEVERAL VARIABLES—4 cr. (5 and 0)
Same as Math 206 except this honors section is open to students only by invitation.

MATH 207—MULTIPLE DIMENSION CALCULUS—3 cr. (3 and 0)
Principal topics include differential and integral calculus for functions of several variables, extreme values of functions, Lagrangian multipliers, differential equations and difference equations. Examples from the managerial and social sciences. *Prerequisite:* Math 108.

MATH 208—ENGINEERING MATHEMATICS I—4 cr. (5 and 0)
This course presents an introduction to the study of differential equations, complex variables, and the Laplace transforms. *Prerequisite:* Math 206.

MATH H208—ENGINEERING MATHEMATICS I—4 cr. (5 and 0)
Same as Math 208 except that this honors section is open to students only by invitation.

MATH 215—ALGEBRA FOR ELEMENTARY SCHOOL TEACHERS—3 cr. (3 and 0)
Linear equations and linear inequalities in one variable, functions and graphs, systems of linear equations and linear inequalities, quadratic equations, complex number system. Finite number systems, algebraic structures.

MATH 216—GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS—3 cr. (3 and 0)
An informal treatment of the basic concepts of geometry.

MATH 295—FOUNDATION OF ANALYSIS—3 cr. (3 and 0)
An introduction to the language and use of symbolic logic and the properties of the real number system with applications to the calculus. *Prerequisite:* Math 108.

MATH 301—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)
Principal topics include: elementary probability theory, discrete and continuous random variables, expected values, normal distribution, chi-square distribution, t-distribution, F-distribution, test of hypothesis, point and interval estimation, curve fitting. *Prerequisite:* Math 206.

MATH H301—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)
Same as Math 301 except that this honors section is open to students only by invitation.

MATH 308—COLLEGE GEOMETRY—3 cr. (3 and 0)
Theorems and concepts more advanced than those of high school geometry. A treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Prerequisite:* Math 106.

MATH 309—ENGINEERING MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math 208. An introduction to Fourier Series, numerical methods, partial differential equations and certain special functions is given. *Prerequisite:* Math 208.

MATH H309—ENGINEERING MATHEMATICS II—3 cr. (3 and 0)
Same as Math 309 except that this honors section is open to students only by invitation.

MATH 402—THEORY OF PROBABILITY—3 cr. (3 and 0)
Principal topics include: combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. *Prerequisite:* Math 206.

MATH H402—THEORY OF PROBABILITY—3 cr. (3 and 0)
Same as Math 402 except that this honors section is open to students only by invitation.

MATH 403—STATISTICAL INFERENCE—3 cr. (3 and 0)
Principal topics include: sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypothesis, likelihood ration methods, regression and correlation analysis, introduction to analysis of variance. *Prerequisite:* Math 402.

MATH H403—STATISTICAL INFERENCE—3 cr. (3 and 0)
Same as Math 403 except that this honors section is open to students only by invitation.

MATH 404—INTRODUCTION TO STOCHASTIC PROCESSES—3 cr. (3 and 0)
Principal topics include—random variables, counting processes, stationary processes, ergodic processes, spectral distribution function, examples from scientific fields to indicate the use of stochastic processes in construction of models of physical and behavioral phenomena. *Prerequisite:* Math 402.

MATH 405—STATISTICAL THEORY AND METHODS II—3 cr. (3 and 0)
Principal topics include contingency tables, goodness of fit, rank-sum tests. Kolmogorov-Smirnov tests, analysis of variance, factoral experimentation, applications to reliability and life testing, applications to quality assurance. *Prerequisite:* Math 301.

MATH 407—PARTIAL DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)
Partial differentiation and space geometry, origins of partial differential equations, linear and non-linear equations of the first order, Fourier series, linear equations of the second and higher orders. *Prerequisite:* Math 208.

MATH 408—TOPICS IN GEOMETRY—3 cr. (3 and 0)
An introduction to topics in special geometries which include non-Euclidean space concepts, such as projective geometry, finite geometries, and intuitive elementary topology. A brief introduction to vector geometry. *Prerequisite:* Math 206.

MATH 409—STATISTICAL THEORY AND METHODS III—3 cr. (3 and 0)
A continuation of Math 405 with equal emphasis on both the mathematical foundations and practical applications of advanced statistical methods. Principal topics include: experimental designs, fractionally replicated experiments, multiple regression and response surface analysis, evolutionary operations, simultaneous inference, analysis of covariance, and time series analysis. *Prerequisite:* Math 405.

Math 411—Linear Algebra—3 cr. (3 and 0)
An introduction to the algebra of matrices, vector spaces, polynomials and linear transformations. *Prerequisite:* Math 206.

Math 412—Introduction to Modern Algebra—3 cr. (3 and 0)
An introduction to the concepts of algebra. Topics included are the number system; elementary theory of groups; rings, integral domains, and fields; matrices over a field; determinants and matrices; groups, rings, and ideals. *Prerequisite:* Math 206.

Math H412—Introduction to Modern Algebra—3 cr. (3 and 0)
Same as Math 412 except that this honors section is open to students only by invitation.

Math 413—Modern Algebra—3 cr. (3 and 0)
A continuation of Math 412.

Math H413—Modern Algebra—3 cr. (3 and 0)
Same as Math 413 except that this honors section is open to students only by invitation.

Math 415—Introduction to Topology—3 cr. (3 and 0)
An introduction to point set topology; Hausdorff, regular and normal spaces; metric connected and compact spaces; continuous mappings and homeomorphisms. *Prerequisite:* Math 295.

Math H415—Introduction to Topology—3 cr. (3 and 0)
Same as Math 415 except that this honors section is open to students only by invitation.

Math 417—Mathematics Programs—3 cr. (3 and 0)
Aspects of the new high school programs in mathematics. Open only to in-service teachers or students in the Mathematics Teacher Training Program. *Prerequisite:* Math 308; *corequisite:* Math 408.

Math 419—Applied Combinatorial Algebra I—3 cr. (3 and 0)
This course applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, hemomorphisms, and permutation groups to computer characterization and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. Computer algorithms for listing permutations, combinations, compositions, and partitions and for representation and processing of digital information are considered. *Prerequisite:* Math 206.

Math 420—Applied Combinatorial Algebra II—3 cr. (3 and 0)
This course applies graph theory, ring and field theory, cardinality of sets, and difference equations to Nim games and other perfect information games, transport networks, shortest route problems, polynomial codes, Bose-Chandhuri-Hoquenghem codes, machine computability, mathematical linguistics, classification of programming languages, and different codes. *Prerequisite:* Math 419, or Math 412, or consent of instructor.

Math 422—Mathematical Logic—3 cr. (3 and 0)
A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Sufficient mathematical background.

MATH 424—FOUNDATIONS OF MATHEMATICS—3 cr. (3 and 0)
Naive set theory, cardinal and ordinal numbers, and axiom of choice and equivalents. A study of the set theoretic fundamentals of abstract mathematics.

MATH 425—INTERMEDIATE DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)
Second order linear differential equations, regular singular points, Bessel, Legendre and hypergeometric functions, general linear equations, existence and uniqueness theorems, plane autonomous systems and phase plane concepts, Sturm-Louville systems. *Corequisite:* Advanced Calculus.

MATH 429—NUMERICAL ANALYSIS I—3 cr. (3 and 0)
Difference and summation calculus, round off noise, finite Fourier series, polynomial approximation, numerical solution of differential equations. *Prerequisite:* Math 453 or Math 463.

MATH 435—COMPLEX VARIABLES—3 cr. (3 and 0)
Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping. Schwartz-Christoffel transformation. *Prerequisite:* Math 453 or Math 463.

MATH H435—COMPLEX VARIABLES—3 cr. (3 and 0)
Same as Math 435 except that this honors section is open to students only by invitation.

MATH 452—LINEAR PROGRAMMING—3 cr. (3 and 0)
An introduction to linear programming, using elementary matrix algebra and the theory of convex polygons. Applications to managerial problems, operations research, economic behavior, the theory of games and military strategy are considered. *Prerequisite:* Math 206 or permission of the instructor.

MATH 453—ADVANCED CALCULUS I—3 cr. (3 and 0)
Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Prerequisite:* Math 208 and Junior standing.

MATH 454—ADVANCED CALCULUS II—3 cr. (3 and 0)
A continuation of Math 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals.

MATH 457—APPLIED MATHEMATICS I—cr. (3 and 0)
Determinants and matrices, review of differential equations, finite differences, Fourier series and integrals, Laplace transformations, a large selection of applications. *Prerequisite:* Math 208.

MATH 458—APPLIED MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math 457. Partial differential equations, Bessel functions and Legendre polynomials, analytic functions of complex variables, infinite series in a complex plane, the theory of residues, conformal mapping. *Prerequisite:* Math 457.

MATH 463—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)
Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. *Prerequisite:* Math 295.

MATH H463—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)
Same as Math 463 except that this honors section is open to students only by invitation.

MATH 464—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Math 463.

MATH H464—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Math H463. This honors section is open to students only by invitation.

MATH 471—APPLIED STATISTICAL DECISION THEORY—3 cr. (3 and 0)
An introduction to statistical decision theory emphasising the Bayesian approach. Behavioral axioms, characterizing the "Rational decision maker," lead to the laws of probability theory and utility theory. Topics include: axioms of subjective probability and utility, extensive and normal form analysis, likelihood principle, conjugate distributions. *Prerequisite:* Math 402.

MATH 473—INTRODUCTION TO NONLINEAR OPTIMIZATION—3 cr. (3 and 0)
An introduction to the application and theory of nonlinear optimization problems. The primary topics include: classical optimization based on the calculus, approximation techniques, separable programming, quadratic programming, gradient methods, and dynamic programming. *Prerequisite:* Math 452, 453.

MATH H481—HONORS SEMINAR IN MATHEMATICS—Credit to be arranged (3 and 0)
At the discretion of the instructor, attention will be focused upon mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis will be upon independent study and student use of previously acquired mathematical skills and his own ingenuity in the examination, presentation or preparation of mathematical papers. These papers may be expository or creative in content and may deal with applications of the mathematics under investigation. This honors course is open to students only by invitation for not more than three hours credit.

MATH H482—HONORS SEMINAR IN MATHEMATICS—Credit to be arranged. (3 and 0)
A continuation of Math H481.

MATH 601—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)

MATH 602—THEORY OF PROBABILITY—3 cr. (3 and 0)

MATH 603—STATISTICAL INFERENCE—3 cr. (3 and 0)

MATH 604—INTRODUCTION TO STOCHASTIC PROCESSES—3 cr. (3 and 0)

MATH 605—STATISTICAL THEORY AND METHODS II—3 cr. (3 and 0)

MATH 607—PARTIAL DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 608—TOPICS IN GEOMETRY—3 cr. (3 and 0)

MATH 609—STATISTICAL THEORY AND METHODS III—3 cr. (3 and 0)

MATH 611—LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 612—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)

MATH 613—MODERN ALGEBRA—3 cr. (3 and 0)

Math 615—Introduction to Topology—3 cr. (3 and 0)

Math 617—Mathematics Programs—3 cr. (3 and 0)

Math 619—Applied Combinatorial Algebra I—3 cr. (3 and 0)

Math 620—Applied Combinatorial Algebra II—3 cr. (3 and 0)

Math 625—Intermediate Differential Equations—3 cr. (3 and 0)

Math 629—Numerical Analysis I—3 cr. (3 and 0)

Math 635—Complex Variables—3 cr. (3 and 0)

Math 652—Linear Programming—3 cr. (3 and 0)

Math 653—Advanced Calculus I—3 cr. (3 and 0)

Math 654—Advanced Calculus II—3 cr. (3 and 0)

Math 657—Applied Mathematics I—3 cr. (3 and 0)

Math 658—Applied Mathematics II—3 cr. (3 and 0)

Math 663—Mathematical Analysis I—3 cr. (3 and 0)

Math 664—Mathematical Analysis II—3 cr. (3 and 0)

Math 671—Applied Statistical Decision Theory—3 cr. (3 and 0)

Math 673—Introduction to Nonlinear Optimization—3 cr. (3 and 0)

Math 801—General Linear Hypothesis I—3 cr. (3 and 0)

Math 802—General Linear Hypothesis II—3 cr. (3 and 0)

Math 803—Stochastic Processes I—3 cr. (3 and 0)

Math 804—Stochastic Processes II—3 cr. (3 and 0)

Math 807—Mathematical Statistics I—3 cr. (3 and 0)

Math 808—Mathematical Statistics II—3 cr. (3 and 0)

Math 811—Nonlinear Programming—3 cr. (3 and 0)

Math 812—Dynamic Programming—3 cr. (3 and 0)

Math 813—Advanced Linear Programming—3 cr. (3 and 0)

Math 821—Real Analysis I—3 cr. (3 and 0)

Math 822—Real Analysis II—3 cr. (3 and 0)

Math 823—Complex Analysis I—3 cr. (3 and 0)

Math 824—Complex Analysis II—3 cr. (3 and 0)

Math 825—Ordinary Differential Equations I—3 cr. (3 and 0)

Math 826—Ordinary Differential Equations II—3 cr. (3 and 0)

Math 831—Fourier Series—3 cr. (3 and 0)

Math 833—Operational Mathematics—3 cr. (3 and 0)

Math 837—Calculus of Variations—3 cr. (3 and 0)

Math 839—Integral Equations—3 cr. (3 and 0)

MATH 841—APPLIED MATHEMATICS I—3 cr. (3 and 0)

MATH 842—APPLIED MATHEMATICS II—3 cr. (3 and 0)

MATH 851—ABSTRACT ALGEBRA I—3 cr. (3 and 0)

MATH 852—ABSTRACT ALGEBRA II—3 cr. (3 and 0)

MATH 853—ADVANCED LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 854—THEORY OF GRAPHS I—3 cr. (3 and 0)

MATH 855—COMBINATORIAL ANALYSIS—3 cr. (3 and 0)

MATH 861—NUMERICAL ANALYSIS II—3 cr. (3 and 0)

MATH 863—CALCULUS OF FINITE DIFFERENCES—3 cr. (3 and 0)

MATH 871—GENERAL TOPOLOGY I—3 cr. (3 and 0)

MATH 872—GENERAL TOPOLOGY II—3 cr. (3 and 0)

MATH 873—ALGEBRAIC TOPOLOGY I—3 cr. (3 and 0)

MATH 874—ALGEBRAIC TOPOLOGY II—3 cr. (3 and 0)

MATH 875—CONVEXITY I—3 cr. (3 and 0)

MATH 876—CONVEXITY II—3 cr. (3 and 0)

MATH 881—HISTORY OF MATHEMATICS—3 cr. (3 and 0)

MATH 883—THEORY OF NUMBERS—3 cr. (3 and 0)

MATH 885—PROJECTIVE GEOMETRY—3 cr. (3 and 0)

MATH 891—RESEARCH—Credit to be arranged.

MATH 901—PROBABILITY THEORY I—3 cr. (3 and 0)

MATH 902—PROBABILITY THEORY II—3 cr. (3 and 0)

MATH 903—ADVANCED STOCHASTIC PROCESSES—3 cr. (3 and 0)

MATH 905—DECISION THEORY I—3 cr. (3 and 0)

MATH 906—DECISION THEORY II—3 cr. (3 and 0)

MATH 907—MULTIVARIATE ANALYSIS—3 cr. (3 and 0)

MATH 920—INTRODUCTION TO HARMONIC ANALYSIS—3 cr. (3 and 0)

MATH 921—ABSTRACT HARMONIC ANALYSIS I—3 cr. (3 and 0)

MATH 922—ABSTRACT HARMONIC ANALYSIS II—3 cr. (3 and 0)

MATH 923—INTRODUCTION TO THE THEORY OF DISTRIBUTION I—3 cr. (3 and 0)

MATH 924—INTRODUCTION TO THE THEORY OF DISTRIBUTION II—3 cr. (3 and 0)

MATH 925—TOPICS IN NON-LINEAR DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 927—FUNCTIONAL ANALYSIS I—3 cr. (3 and 0)

MATH 928—FUNCTIONAL ANALYSIS II—3 cr. (3 and 0)

MATH 929—FUNCTIONAL ANALYSIS III—3 cr. (3 and 0)

MATH 930—FUNCTIONAL ANALYSIS IV—3 cr. (3 and 0)

MATH 945—POTENTIAL THEORY I—3 cr. (3 and 0)

MATH 946—POTENTIAL THEORY II—3 cr. (3 and 0)

MATH 951—GROUP THEORY—3 cr. (3 and 0)

MATH 952—RING THEORY I—3 cr. (3 and 0)

MATH 953—RING THEORY II—3 cr. (3 and 0)

MATH 954—THEORY OF GRAPHS II—3 cr. (3 and 0)

MATH 955—COMBINATORIAL ANALYSIS II—3 cr. (3 and 0)

MATH 956—FIELD THEORY—3 cr. (3 and 0)

MATH 957—SEMIGROUP THEORY I—3 cr. (3 and 0)

MATH 958—SEMIGROUP THEORY II—3 cr. (3 and 0)

MATH 980—SPECIAL TOPICS IN PROBABILITY—3 cr. (3 and 0)

MATH 981—SPECIAL TOPICS IN MATHEMATICAL STATISTICS—1-3 cr. (1-3 and 0)

MATH 982—SPECIAL TOPICS IN ANALYSIS—1-3 cr. (1-3 and 0)

MATH 983—SPECIAL TOPICS IN FUNCTIONAL ANALYSIS—1-3 cr. (1-3 and 0)

MATH 984—SPECIAL TOPICS IN APPLIED MATHEMATICS—1-3 cr. (1-3 and 0)

MATH 985—SPECIAL TOPICS IN ALGEBRA—1-3 cr. (1-3 and 0)

MATH 986—SPECIAL TOPICS IN CONVEXITY—1-3 cr. (1-3 and 0)

MATH 991—RESEARCH—credit variable.

MECHANICAL ENGINEERING

Professors: D. W. BRADBURY, J. L. EDWARDS, *Acting Head;* T. C. HARDIN, E. HARRISON, A. D. LEWIS, S. M. WATSON, T. YANG

Associate Professors: A. C. ELROD, C. A. BRANDON, E. F. COXE, J. C. HESTER, W. G. HUDSON, J. K. JOHNSON, JR., D. W. LYONS, C. S. RUDISILL

ME 201—ENGINEERING DESIGN AND PRODUCTION—3 cr. (2 and 3)
An introduction to engineering design with emphasis on creativity, synthesis, participation in a realistic experience in design to satisfy human needs, experimentation and analysis commensurate with the student's background in mathematics and science. Problems are authentic. The building of a prototype, at least of critical parts, is the consummation of the design. Nontechnical aspects of engineering such as cost, market, contracts, and ethics are stressed. Engineering materials and methods of production are introduced to assist the student in making decisions concerning material selection and methods of production. *Corequisite:* EG 109, Phys 122, and Sophomore standing.

ME 299—DIGITAL COMPUTATION—1 cr. (0 and 3)
An introduction to digital computer programming for students majoring in mechanical engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in mechanical engineering. *Prerequisite:* Sophomore standing.

ME 304—HEAT TRANSFER I—3 cr. (3 and 0)
A comprehensive study of the principles of heat transmission with applications to engineering problems. Special emphasis is given to the following topics: heat conduction in the steady and unsteady states; dimensional analysis of convection; free and forced convection; the combined efforts of conduction, convection and radiation. *Prerequisite:* Junior standing, ME 311, or ChE 331, and Math 208.

ME 307—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
For those curriculums requiring one course in Mechanical Engineering Laboratory. The course is intended to illustrate mechanical engineering theory and to develop experimental technique. Experiments in the first and second laws of thermodynamics are covered. *Prerequisite:* ME 311.

ME 311—ENGINEERING THERMODYNAMICS I—3 cr. (3 and 0)
A study of thermodynamics as an engineering science. Topics stressed are the first and second laws of thermodynamics, properties of the pure substance, ideal gases, and gaseous mixtures. *Prerequisite:* Math 208, Phys 222, and Junior standing.

ME H311—ENGINEERING THERMODYNAMICS I—3 cr. (3 and 0)
Honors section of ME 311; admission by invitation.

ME 312—ENGINEERING THERMODYNAMICS II—3 cr. (3 and 0)
Chemical reactions and combustion, chemical equilibrium; analyses of processes and cycles; introduction to statistical thermodynamics, kinetic theory of gases, and irreversible thermodynamics. *Prerequisite:* ME 311.

ME 313—INSTRUMENTATION AND MEASUREMENTS—2 cr. (1 and 2)
Principles of measurements, accuracy of instruments, and data analysis. Modern instruments for measuring and recording static and dynamic pressures, temperatures, fluid flow, speed, power, and torque. *Prerequisite:* Enrollment in ME 311.

ME 314—ENGINEERING EXPERIMENTATION—2 cr. (1 and 2)
Theoretical, analytic and statistical aspects of basic engineering experimentation. Error analysis, dimensional analysis, experimental plans, and data analyses. *Prerequisite:* Math 301 and ME 313.

ME 316—DYNAMIC SYSTEM ANALYSIS—4 cr. (3 and 3)
Principles of dynamic system response with emphasis on the determination of mathematical models for mechanical, electrical, electomechanical, fluid and thermal systems. Differential equations are developed from a consideration of physical laws, system arrangement, and constraints. The Lagrangian state function and Lagrange's equation are introduced. Transient and steady-state analyses make use of Laplace transforms and frequence response techniques. Computers are used extensively. *Prerequisite:* Math 208, Phys 221, EM 202. *Corequisite:* EE 330, EE 331.

ME 321—FLUID DYNAMICS—3 cr. (3 and 0)
A study of the theory of fluids in motion. Topics include: review of concepts from thermodynamics as applied to the governing equations of fluids in motion; wave propagation in a fluid; types of fluid flow; one dimensional adiabatic flow with variable area; normal and oblique shocks and expansion fans; attached and detached shocks; shock-boundary layer interaction; one

dimensional flow with friction and heat transfer; introduction to viscous flow theory; introduction to potential flow theory; selected applications. *Prerequisite:* EM 320, ME 311.

ME 401—PRINCIPLES OF MECHANICAL ENGINEERING DESIGN—3 cr. (3 and 0)
Stress, strain and strength considerations in engineering design. Theories of failure for yielding, brittle fracture and fatigue fracture are presented. Design considerations for impact, creep, elastic deflection, stress concentration, contact stresses and reliability are studied. Engineering problems are assigned to implement applications of principles of design. *Prerequisite:* EM 304, ME 316. *Corequisite:* CrE 310, Senior standing.

ME 402—MECHANICAL ENGINEERING ANALYSIS AND DESIGN—3 cr. (1 and 6)
The student is given the opportunity to apply creatively his general knowledge and his knowledge of engineering in the analysis and design of one or more engineering systems, machines, or devices. Problems may be selected from two sources: A meritorious problem of the student's own choice or a problem assigned by appropriate authority. *Corequisite:* ME 401, Senior standing.

ME 404—AUTOMATIC CONTROL—3 cr. (3 and 0)
Principles and techniques for the analysis and design of feedback control systems. State variable notation and modern control theory are introduced but emphasis is on the classical frequency domain and root locus techniques. Applications to electromechanical, hydraulic, and pneumatic systems. *Prerequisite:* ME 316, EE 332.

ME 406—PHYSICAL SYSTEMS ANALYSIS AND DESIGN—3 cr. (3 and 0)
A general approach to the analysis and synthesis of physical systems based on state variable representation, Lagrange's equations, matrix solution to state equations, and the calculus of variations. Computer solutions are obtained for application to mechanical, electrical, fluid, and thermal systems. *Prerequisite:* ME 316.

ME 408—INTRODUCTION TO COMPUTER-AIDED DESIGN—3 cr. (3 and 0)
Introduction to computer aided design, reliability, figures of merit, optimization techniques, search for extremes, and decision theory in design. Computer aided optimum design of engineering systems and the writing and use of problem-oriented languages will be emphasized. *Prerequisite:* Senior standing.

ME 411—GAS POWER—3 cr. (3 and 0)
A study of the effects of variation in specific heat, some fundamentals of compressible flow, the combustion process, and chemical dissociation. The theoretical and actual processes associated with the gas turbine, the thermal jet, the thermal rocket, and the spark ignition and compression ignition reciprocating engines are analyzed. *Prerequisite:* ME 312 and Senior Engineering.

ME 412—APPLIED THERMODYNAMICS—3 cr. (3 and 0)
Basic principles of first and second laws of thermodynamics applied to areas such as cryogenics, nonconventional energy conversion process, industrial process heat and electric power systems, etc. *Prerequisite:* ME 312.

ME 413—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
Experimental investigations in a wide variety of mechanical engineering areas, such as fluid dynamics, automatic control, heat and mass transfer, combustion, thermodynamics, and solid mechanics. *Prerequisite:* ME 313 and 314.

ME 414—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
Continuation of ME 413.

ME 415—UNDERGRADUATE RESEARCH—1 to 3 cr.
Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Consent of instructor.

ME H415—UNDERGRADUATE RESEARCH—1 to 3 cr.
Honors section of ME 415; admission by invitation.

ME 416—UNDERGRADUATE RESEARCH—1 to 3 cr.
Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Consent of instructor.

ME 422—PRINCIPLES OF TURBOMACHINERY—3 cr. (3 and 0)
The guiding principles underlying all forms of turbomachinery. A unified treatment of turbomachinery to include pumps, fans, compressors and steam, gas and hydraulic turbines. Dimensional analysis as applied to turbomachinery, Euler's Equation, concepts of specific speed and thermodynamics of turbomachinery processes and allied topics are covered. *Prerequisite:* ME 312, EM 320, and Senior standing.

ME 424—ENGINEERING ANALYSIS—3 cr. (2 and 3)
A senior-level course requiring the student to utilize his knowledge of mathematics, fluid and solid mechanics, thermodynamics, heat transfer, and other background work in solving engineering problems. Both analog and digital computers are utilized as tools contributing to these solutions. *Prerequisite:* ME 299, ME 312, ME 304, EM 320.

ME 429—AIR CONDITIONING—3 cr. (3 and 0)
A study of the principles of heating and air conditioning, including calculation of heat loss and heat gains for buildings, heating and cooling systems, psychrometric principles, air distribution, refrigeration and automatic control apparatus. *Prerequisite:* ME 304, 312, and Senior standing.

ME 430—AIR CONDITIONING DESIGN—1 cr. (0 and 3)
An application of the theory covered in ME 429 to the design of air-conditioning systems. *Prerequisite:* Enrollment in ME 429.

ME 441—AEROELASTICITY—3 cr. (3 and 0)
Two and three dimensional theory of structural vibration and wing flutter. Lagrangian equations, energy methods, matrix methods and computer techniques for vibration analysis will be presented. Structural damping, aerodynamic forces, and flutter stability will be studied. Vertical bending, torsional vibration and flutter of fuselages, ailerons and stabilizers will be analyzed.

ME 480—METHODS OF OPERATIONS RESEARCH I—3 cr. (3 and 0)
Applications and elementary theory of selected topics from Operations Research. Topics included are linear algebra, linear programming, transportation and assignment problems, network analysis, and game theory. *Prerequisite:* ME 229 or equivalent.

ME 481—METHODS OF OPERATIONS RESEARCH II—3 cr. (3 and 0)
A continuation of ME 480. Topics included are nonlinear programming, dynamic programming, queuing theory, and markov processes. *Prerequisite:* Math 301 or equivalent.

ME 484—Engineering Economic Analysis—3 cr. (3 and 0)
Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness. *Prerequisite:* Senior standing in Engineering or consent of instructor.

ME 485—Industrial Application of Statistics—3 cr. (3 and 0)
Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability and analysis, and machine interference. *Prerequisite:* Math 301.

ME 486—Work Flow Systems and Control—3 cr. (3 and 0)
Fundamentals underlying the determination of production capacity requirements, economic lot sizes, and the regulating of flow and storage of materials to, within, and from the production system. Elements of forecasting, determination of materials requirements, scheduling, inventory control, etc. Consideration of data processing methods. *Prerequisite:* Math 301, consent of instructor.

ME 491—Selected Topics in Mechanical Engineering—3 cr. (3 and 0)
A comprehensive study of any topic in the field of Mechanical Engineering not covered in other courses.

ME 601—Principles of Mechanical Engineering Design—3 cr. (3 and 0)

ME 602—Mechanical Engineering Alalysis and Design—3 cr. (1 and 6)

ME 604—Automatic Control—3 cr. (3 and 0)

ME 606—Physical Systems Analysis and Design—3 cr. (3 and 0)

ME 608—Computer-Aided Design—3 cr. (3 and 0)

ME 611—Gas Power—3 cr. (3 and 0)

ME 680—Methods of Operations Research I—3 cr. (3 and 0)

ME 681—Methods of Operations Research II—3 cr. (3 and 0)

ME 684—Engineering Economic Analysis—3 cr. (3 and 0)

ME 685—Industrial Application of Statistics—3 cr. (3 and 0)

ME 686—Work Flow Systems and Control—3 cr. (3 and 0)

ME 808—Fluid Mechanics—3 cr. (3 and 0)

ME 809—Aerodynamics—3 cr. (3 and 0)

ME 810—Advanced Thermodynamics—3 cr. (3 and 0)

ME 811—Gas Dynamics II—3 cr. (3 and 0)

ME 812—Boundary Layer Theory I—3 cr. (3 and 0)

ME 813—Gas Dynamics III—3 cr. (3 and 0)

ME 814—Hypersonics—3 cr. (3 and 0)

ME 815—Kinetics Theory of Gases—3 cr. (3 and 0)

ME 830—Heat Transfer II—3 cr. (3 and 0)

ME 831—Heat and Mass Transfer III—3 cr. (3 and 0)

ME 840—Kinematics II—3 cr. (3 and 0)

ME 842—Advanced Mechanical Engineering Design I—3 cr. (3 and 0)

ME 843—Advanced Mechanical Engineering Design II—3 cr. (3 and 0)

ME 844—Dynamics of Elastic Mechanical Systems—3 cr. (3 and 0)

ME 860—Dynamic Programming—3 cr. (3 and 0)

ME 861—Nonlinear Programming—3 cr. (3 and 0)

ME 862—Analytical Methods of Systems Analysis—3 cr. (3 and 0)

ME 863—Advanced Physical Systems I—3 cr. (3 and 0)

ME 864—Advanced Physical Systems II—3 cr. (3 and 0)

ME 865—Modern Control Theory—3 cr. (3 and 0)

ME 866—Nonlinear Automatic Controls—3 cr. (3 and 0)

ME 867—Control System Components—3 cr. (3 and 0)

ME 868—Control of Aerospace Systems—3 cr. (3 and 0)

ME 870—Biosystems Analysis—3 cr. (3 and 0)

ME 880—Advanced Methods of Operations Research I—3 cr. (3 and 0)

ME 881—Advanced Methods of Operations Research II—3 cr. (3 and 0)

ME 882—Reliability Engineering—3 cr. (3 and 0)

ME 883—Operations System Simulation I—3 cr. (3 and 0)

ME 884—Operations System Simulation II—3 cr. (3 and 0)

ME 885—Design and Analysis of Simulation Models—3 cr. (3 and 0)

ME 886—Operations Research in Production Control—3 cr. (3 and 0)

ME 887—Operations Research in Production Control II—3 cr. (3 and 0)

ME 888—Applied Queueing Theory and Markov Programming—3 cr. (3 and 0)

ME 891—Research—Credit to be arranged.

ME 893—Selected Topics in Mechanical Engineering—1-6 cr. (1-6 and 0)

ME 912—Boundary Layer Theory II—3 cr. (3 and 0)

ME 914—Magnetohydrodynamics—3 cr. (3 and 0)

ME 915—Energy Conversion—3 cr. (3 and 0)

ME 930—Conduction Heat Transfer—3 cr. (3 and 0)

ME 931—Convection Heat Transfer—3 cr. (3 and 0)

ME 932—Radiation Heat Transfer—3 cr. (3 and 0)

ME 940—Applied Plasticity—3 cr. (3 and 0)

ME 941—Theory of Lubrication and Wear—3 cr. (3 and 0)

ME 991—Doctoral Research—Credit to be arranged.

MEDICAL TECHNOLOGY

Anderson—*Lecturers:* J. W. BLACK, R. E. JONES. JR., N. L. LONG
Teaching Supervisor: KAY LITTLE
Greenville—*Lecturers:* E. C. COX, E. A. DRESKIN, D. G. KILGORE, JR., J. H. MCCARTER, W. M. WATERS
Teaching Supervisor: PATRICIA THOMPSON

MED TECH 101—AN INTRODUCTION TO MEDICAL TECHNOLOGY—1 cr. (1 and 0)

An introduction to the operation and practices in a medical laboratory. This course is designed to integrate the academic year with the clinical year. Included will be lectures on current laboratory practices, a visit to a modern medical laboratory, current training of laboratory personnel and seminars on areas of specialization.

MED TECH 401—SEROLOGY AND IMMUNOLOGY—4 cr. (21,10,49)*

Presents the basic principles of serology and immunology and the tests utilizing these principles to detect abnormalities helpful in the diagnosis of disease.

MED TECH 402—MICROBIOLOGY—7 cr. (59,6,470)

The principles of microbiology-bacteriology, mycology, and parasitology. Emphasis is placed on human pathogenic organisms, using both fresh and prepared organisms.

MED TECH 403—HEMATOLOGY—5 cr. (12,32,276)

Information on blood as a tissue, the theory of hematological tests, factors that affect test reliability. Knowledge of test results and knowledge of blood dyscrasias. Skill in the performance of hematological tests is emphasized and the use of automation techniques is covered.

MED TECH 404—BLOOD BANK—3 cr. (8,20,132)

History and principles of blood group systems and methods of cross matching. Testing for, and quantitative determination of, Rh antibodies with all available techniques. Selection, pre-testing and bleeding of donors and processing of blood for transfusions.

MED TECH 405—CYTOLOGY—1 cr. (2,12,26)

An introduction to cytology and cytologic techniques in the diagnosis of cancer. Definition and brief history, sources of material, collection and preservation of specimens, together with practice in interpretation.

MED TECH 406—HISTOLOGY—3 cr. (20,30,190)

Histologic preparation, including actual preparation of tissue specimens derived from surgical procedures and autopsies. Routine and special staining, together with experience using the Cryostat.

MED TECH 407—URINALYSIS—2 cr. (10,8,102)

The study of renal function together with principles of urine analysis, pregnancy tests and anatomy of the urinary system. Emphasis is placed on laboratory procedures and their utilization to detect abnormalities helpful in the diagnosis of disease.

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* First figure represents lecture hours, second figure represents seminar hours, and the third figure represents clinical practice hours.

Med Tech 408—Chemistry—10 cr. (40,50,470)
Introduction to the chemistry of carbohydrates, nitrogen, calcium, and phosphorus compounds, acid-base balance, etc., with emphasis on the chemistry of blood and urine using both qualitative and quantitative procedures in the laboratory.

Med Tech 409—Radioisotopes—1 cr. (2,0,7)
Introduction to principles of diagnostic radioisotope procedures and the use of the scintillation detector, the well counter, and the scaler.

METALLURGICAL ENGINEERING

Associate Professors: S. F. Hulbert, *Program Coordinator;* J. S. Wolf
Assistant Professor: J. E. Lemons

MetE 402—Metallurgical Literature—1 cr. (0 and 3)
To acquaint students with sources of information on metallurgy and to develop a background for the senior thesis. *Prerequisite:* Senior standing in Metallurgical Engineering.

MetE 408—Heat Treating—3 cr. (2 and 3)
The phase changes in both ferrous and non-ferrous metals caused by changes in environment at significant times in the processing. Studies relating the time-temperature changes in metals with their physical properties. *Prerequisite:* MetE 302 or MetE 304.

MetE 425—Senior Thesis—2 cr. (0 and 6)
The independent investigation of a project in Metallurgical Engineering. A competent bachelor thesis is required. *Prerequisite:* Senior standing in Metallurgical Engineering.

MetE 430—Powder Metallurgy—3 cr. (2 and 3)
The production of metal powders and of articles from these powders. By powder metal techniques it is possible to produce controlled porosity, unconventional alloys and to produce complex parts of limited size rapidly, accurately, and economically. Combinations of metals and non-metals may be produced. *Prerequisite:* MetE 302 or MetE 304.

MetE 440—Metallurgy of Reactor Materials—3 cr. (2 and 3)
The metallurgy of materials used in reactor construction. The physical metallurgy of metallic fuels, controls, reflectors, and shielding. The effects of radiation on structural metals will be considered. *Prerequisite:* Senior standing and the consent of the instructor.

MetE 450—Metallic Corrosion—3 cr. (2 and 3)
The corrosion of metallic materials and means of preventing such corrosion. Environmental factors in corrosion are considered. *Prerequisite:* MetE 302 or MetE 304.

MetE 455—Electrometallurgy—3 cr. (2 and 3)
The electrowinning and electrorefining of metals. Electrothermic cells will be studied. The principles and operation of electric furnaces will be considered. Electroplating, electroetching and electromachining will be studied. *Prerequisite:* MetE 302 or MetE 304 and EE 308.

MetE 608—Heat Treating—3 cr. (2 and 3)

MetE 650—Metallic Corrosion—3 cr. (2 and 3)

MICROBIOLOGY

(See also Biology)

Professor: R. K. Guthrie

Associate Professors: J. H. Bond, M. J. B. Paynter, *Chairman*

Assistant Professors: Ann W. Baxter, M. G. Johnson

Micro 305—General Microbiology—4 cr. (3 and 0) F, S, SS
Morphology, physiology, classification, distribution, and cultivation of microorganisms and health. *Prerequisite:* Bot 102 or Zool 102 and 104; Ch 101; Ch 102.

Micro 401—Advanced Bacteriology—4 cr. (2 and 6) F
Metabolism, nutrition, growth, and death of bacteria; microbiological assays and industrial fermentation; emphasis on laboratory procedures for the identification of the more common taxonomic groups. *Prerequisite:* Micro 305; Ch 220 or 223 and 227.

Micro H401—Advanced Bacteriology—4 cr. (2 and 6) F
Honors option for Micro 401, admission by special arrangement.

Micro 402—Dairy Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
Morphology, physiology, and culturing of microorganisms of importance in dairy products; standard methods for the determination of numbers of bacteria, yeasts, and molds in various dairy products. *Prerequisite:* Micro 305.

Micro H402—Dairy Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
Honors option for Micro 402, admission by special arrangement.

Micro 404—Food Microbiology—3 cr. (2 and 3)
S, '71 and alternate years.
The microbiology of natural and processed foods. The nature of microorganisms involved in food processing, food spoilage, and food poisoning. Methods of isolating, enumerating and identifying these organisms are conducted in the laboratory. *Prerequisite:* Micro 305.

Micro H404—Food Microbiology—3 cr. (2 and 3)
S, '71 and alternate years.
Honors option for Micro 404, admission by special arrangement.

Micro 410—Soil Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
The role of microorganisms in the decomposition of organic substances; transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. *Prerequisite:* Micro 305.

Micro H410—Soil Microbiology—3 cr. (2 and 3)
S, '70 and alternate years.
Honors option for Micro 410, admission by special arrangement.

Micro 411—Pathogenic Bacteriology—3 cr. (2 and 3) S
A study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the diseases caused. *Prerequisite:* Micro 305.

MICRO H411—PATHOGENIC BACTERIOLOGY—3 cr. (2 and 3) S
Honors option for Micro 411, admission by special arrangement.

MICRO 412—BACTERIAL PHYSIOLOGY—4 cr. (3 and 3) S
A consideration of the cytology, physiology, metabolism, and genetics of bacteria. Included will be studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. *Prerequisite:* Micro 305, Organic Chemistry

MICRO H412—BACTERIAL PHYSIOLOGY—4 cr. (3 and 3) S
Honors option for Micro 412, admission by special arrangement.

MICRO 413—INDUSTRIAL MICROBIOLOGY—3 cr. (2 and 3)
Microbial aspects of large scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. *Prerequisite:* Micro 305.

MICRO H413—INDUSTRIAL MICROBIOLOGY—3 cr. (2 and 3)
Honors option for Micro 413, admission by special arrangement.

MICRO 414—BASIC IMMUNOLOGY—3 cr. (2 and 3)
A consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigenantibody and other immune reactions. *Prerequisite:* Micro 305, Organic Chemistry.

MICRO H414—BASIC IMMUNOLOGY—3 cr. (2 and 3)
Honors option of Micro 414, admission by special arrangement.

MICRO 415—MICROBIAL GENETICS—4 cr. (3 and 3)
The cytological basis of bacterial genetics; some molecular aspects; mutation and mutagenic agents; population changes; mechanisms of genetic transfers; bacterial viruses as genetic systems; episomes and plasmids. The genetics of certain fungi and of animal and plant viruses will also be considered. *Prerequisite:* Micro 305, Gen 302, Ch 224.

MICRO H415—MICROBIAL GENETICS—4 cr. (3 and 3)
Honors option for Micro 415, admission by special arrangement.

MICRO 416—INTRODUCTORY VIROLOGY—3 cr. (3 and 0)
A general introduction to the field of virology, including animal, bacterial, and plant viruses. Topics will include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay and purification. *Prerequisite:* Micro 305.

MICRO H416—INTRODUCTORY VIROLOGY—3 cr. (3 and 0)
Honors option for Micro 416, admission by special arrangement.

MICRO 601—ADVANCED BACTERIOLOGY—4 cr. (2 and 6)

MICRO 602—DAIRY MICROBIOLOGY—3 cr. (2 and 3)

MICRO 604—FOOD MICROBIOLOGY—3 cr. (2 and 3)

MICRO 605—GENERAL MICROBIOLOGY—4 cr. (3 and 3)

MICRO 610—SOIL MICROBIOLOGY—3 cr. (2 and 3)

MICRO 611—PATHOGENIC BACTERIOLOGY—3 cr. (2 and 3)

Micro 612—Bacterial Physiology—4 cr. (3 and 3)

Micro 613—Industrial Microbiology—3 cr. (2 and 3)

Micro 614—Basic Immunology—3 cr. (2 and 3)

Micro 615—Microbial Genetics—4 cr. (3 and 3)

Micro 616—Introductory Virology—3 cr. (3 and 0)

Micro 801—Bacterial Taxonomy—3 cr. (2 and 3)

Micro 802—Bacteriological Technic—4 cr. (2 and 6)

Micro 803—Special Problems in Microbiology—Credit to be arranged.

Micro 807—Seminar—1 cr. (1 and 0)

Micro 810—Soil Microbiology—3 cr. (2 and 3)

Micro 811—Bacterial Cytology and Physiology—4 cr. (4 and 0)

Micro 812—Bacterial Metabolism—3 cr. (3 and 0)

Micro 813—Bacterial Cytology and Physiology Laboratory—2 cr. (0 and 6)

Micro 814—Bacterial Metabolism Laboratory—2 cr. (0 and 6)

Micro 815—Advanced Microbial Genetics—3 cr. (3 and 0)

Micro 891—Research—Credit to be arranged.

MILITARY SCIENCE

Professor: Colonel George K. Maertens

Assistant Professors: Lt. Col. J. F. Hare, Lt. Col. J. W. Mahaffee, Lt. Col. J. H. Mozeley III, Maj. E. L. Fairbrother, Maj. J. B. Horton, Maj. T. R. King, Maj. J. H. Steed, Capt. P. E. Blackwell, Capt. N. K. Hook, Jr., Capt. R. R. Irvin, Jr., Capt. P. H. Keating, Capt. J. A. McCormack, Capt. S. P. Meyer, Capt. R. J. Stoewe

MS 101—Fundamentals (Basic)—1 cr. (2 and 1)

A study of the evolution, organization, and mission of the Reserve Officers' Training Corps, individual weapons and marksmanship and the evolution of weapons and warfare. An introduction to First Aid, mass casualty treatment and discussion seminar on current events. Laboratory periods provide training in basic drill, discipline, and leadership.

MS 102—The National Defense (Basic)—1 cr. (2 and 1)

A study of the organization of the Department of Defense and its role in national security. An introduction to the history, organization, equipment and mission of the United States Army, with detailed study of small units. A look at the principles and types of war and leadership traits. Current events seminar. Leadership laboratory.

MS 201—American Military History (Basic)—1 cr. (2 and 1)

A survey of American military history from the origins of the American Army to the present, with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social and similar patterns found in our present-day Army.

MS 202—Introduction to Operations and Basic Tactics and Map and Aerial Photograph Reading (Basic)—1 cr. (2 and 1)

An introduction to the organization, composition, and mission of infantry rifle squad and small infantry-tank teams. Interpretation and use of maps and aerial photographs in study and evaluation of terrain.

MS 300—Military Science (Advanced)—6 cr. (ROTC 3, Elective 3)

Study and practical application of Leadership; Military Teaching Principles; Branches of the Army; Small Unit Tactics and Communications. Further training for duty as officers by application of principles of leadership in actual command during drills, parades, reviews, inspections and ceremonies. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective course or Advanced ROTC during either semester but must participate in Leadership Laboratory Training throughout the school year.

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

MS 400—Military Science (Advanced)—6 cr. (ROTC 3, Elective 3)

A study of Military Operations; Logistics; Administrative Management; Military Law; Service Orientation; World Change and Military Implications; Internal Defense/Development; and Leadership Laboratory. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective or Advanced ROTC during either semester but must participate in Leadership Laboratory Training throughout the school year.

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

MUSIC

Associate Professor: J. H. Butler, *Head*

Assistant Professors: B. F. Cook, E. A. Freeman

Instructors: G. A. Benson, Edith B. Card, J. E. Jackson,* E. W. Winston

Mus 151—Applied Music—1 cr. (1 and 0)

Individual study in performance medium (voice, piano, flute, oboe, clarinet, saxophone, bassoon, cornet, trumpet, French Horn, trombone, baritone, tuba, percussion). One hour-long private lesson each week, for which a minimum of four hours' practice is required. The student is guided in a continuing advance of his technical and artistic proficiency, and is required to perform an appropriate solo in a student recital each semester. May be repeated for credit with departmental approval to allow for the study of differing performance media. *Prerequisite:* Consent of instructor, based on a qualifying audition.

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* On leave.

Mus 152—Applied Music—1 cr. (1 and 0)
A continuation of Mus 151. *Prerequisite:* Mus 151.

Mus 205—Music Theory—3 cr. (3 and 0)
The terminology and notation of traditional music are reviewed, and the techniques of sight-singing and sight-reading are practiced. Harmonic practices are studied, relating to the principal diatonic triads in all inversions. *Prerequisite:* Consent of instructor, based on musical literacy.

Mus 206—Music Theory—3 cr. (3 and 0)
Continuation of Music 205 with emphasis on secondary chord structure, modulation, and non-diatonic harmony. Advanced sight-singing and melodic dictation are practiced. *Prerequisite:* Music 205.

Mus 210—Music Appreciation: Music in the Western World—3 cr. (3 and 0)
Designed to deepen the student's appreciation of his musical heritage through a study of the elements of the musical language and its development in western culture.

Mus 315—Music History—3 cr. (3 and 0)
The development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods.

Mus 316—Music History—3 cr. (3 and 0)
Continuation of Mus 315. Music from 1750 to present. *Prerequisite:* Mus 315.

Mus 361—Marching Band—1 cr. (0 and 3)
Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Fall semester only. *Prerequisite:* Consent of director.

Mus 362—Concert Band—1 cr. (0 and 3)
Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Spring semester only. *Prerequisite:* Consent of director.

Mus 365—University Chorus—1 cr. (0 and 3)
Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Prerequisite:* Consent of director.

Mus 400—Music in the Elementary School Classroom—3 cr. (3 and 0)
Designed to give the teacher in the elementary school a familiarity with music suitable for use with children at the elementary level. Recordings of

appropriate music, pre-band instruments, unison and part singing will be included. No previous training in music is required.

Mus 401—Methods and Materials in Elementary School Music—3 cr. (3 and 0)

Materials, methods, and techniques in elementary school. *Prerequisite:* Mus 400.

Mus 411—American Music: Music Appreciation—3 cr. (3 and 0)

Music in America from 1620 to the present. Indigenous and borrowed influences will be examined.

NURSING

Associate Professor: Leon Roswal, *Director*

Assistant Professor: Aileen S. Prevost

Instructors: Edith G. Gunter, Esther B. Privette, Sara Stokes, Harriett E. Whitley

Nurs 100—Orientation—1 cr. (1 and 0)

Series of lectures and discussions on nursing and careers in nursing; personal and professional guidance.

Nurs 101—Fundamentals of Nursing I—6 cr. (3 and 9)

This introductory course is oriented to the normal health needs of all people, sick and well. Study of the concepts and scientific principles of the bio-socio-psychological sciences that are applicable in the nursing practices common to all patients. College and hospital laboratory learning experiences provide an opportunity to adapt these principles and develop beginning skill in selected technical and interpersonal aspects of nursing.

Nurs 102—Fundamentals of Nursing II—6 cr. (3 and 9)

In this course, sequential to Nurs 101, the skills, knowledge and principles are further developed. A patient-centered orientation to basic-nursing practices is continued in assisting the individual to attain and/or maintain homeostasis. Dietary, pharmacological, fluid and electrolyte balance and mental concepts are integrated and correlated. *Prerequisite:* Nurs 101 with grade of C or better.

Nurs 104—Medical-Surgical Nursing I—5 cr. (3 and 6)

A continuation of Nurs 102. It is concerned with nursing care of adult patients with long term illnesses and focuses on disruption of family living. *Prerequisite:* Second semester courses in Nursing with C standing.

Nurs 105—Integrated Science I—4 cr. (3 and 3)

A general course surveying chemistry, human anatomy, physiology, and microbiology, and emphasizing the physical and chemical bases for physiology.

Nurs 106—Integrated Science II—4 cr. (3 and 3)

Continuation of Nurs 105.

Nurs 201—Psychodynamic Nursing—5 cr. (3 and 6)

Designed to develop basic understandings and skills in the nursing care of patients with behavioral and anxiety problems. Lectures, discussions, field trips and clinical experiences are used concurrently. *Prerequisite:* Nurs 202 and Nurs 206 with C standing.

Nurs 202—Pediatrics—5 cr. (3 and 6)
This course presents the nursing care of children from infancy to adolescence. It considers disease processes that cause deviations from normal through all stages of growth and development. *Prerequisite:* Nurs 104 with C standing.

Nurs 204—Maternal and Newborn Care—5 cr. (3 and 6)
This course deals with prenatal, labor, delivery, postpartum care of the mother, and needs of the newborn infant. *Prerequisite:* Nurs 202 and Nurs 206 with C standing.

Nurs 206—Medical-Surgical Nursing II—6 cr. (3 and 9)
This is a continuation of Nurs 104. Emphasis is placed on the planning and executing care plans for groups of patients in conjunction with various co-workers present in hospital settings today. The student is introduced to her responsibilities as a graduate nurse. *Prerequisite:* Nurs 104 with C standing.

NURSING

(Baccalaureate Degree Program)

Professor: Geraldine Labecki, *Director*

Associate Professors: Elizabeth J. Hall, Rose A. Godbout

Assistant Professors: Melba Cather, Regina Thompson

Instructors: Opal S. Hipps, Susan Rockwell

Lecturers: Marilyn B. Chassie, D. K. Freeman, Juanita F. Woods

Nurs 207—Dynamics of Human Relations—3 cr. (2 and 3)
The nursing appraisal of theoretical and clinical approaches to the understanding of the dynamics of human behavior. The identification of behaviors through observing and participating in laboratory experiences in community agencies providing service to adults and children. Incorporates the beginning of a longitudinal study of a selected family.

Nurs 208—Problem Solving in Nursing—3 cr. (2 and 3)
Introduction to the concept of problem solving in nursing throughout health-illness cycle. Selected models are presented and analyzed. Relevant technical skills identified in the analysis are learned. Emphasis on creative approach to solving nursing problems and the utility of the technic to the solution. Laboratory experience in the classroom and with hospitalized patients.

Nurs 309—Human Values in Nursing—3 cr. (3 and 0)
The values guiding nursing theory and practice, including common human needs; the nature of man and his community.

Nurs 310—Perspectives in Nursing Intervention—3 cr. (3 and 0)
Analysis of processes used in making nursing judgments. Emphasis on planning, intervention and evaluation.

Nurs 311—Nursing During Alterations in Life Patterns—4 cr. (1 and 9)
Study of the ways in which people perceive and cope with changes in their life patterns; emphasis on the synthesis of knowledge from the arts and sciences as a basis for deliberative nursing action. Laboratory experience in a variety of settings with all age groups.

NURS 312—NURSING OF THE ACUTELY AND CHRONICALLY DISTRESSED—4 cr. (1 and 9)

Nursing concepts based on a broad patho-psychophysiologic approach toward understanding changes in functions as a result of stress and/or disease. Laboratory experience in agencies providing care for the mentally and physically distressed.

NURS 313—THE PROMOTION OF HEALTH—3 cr. (2 and 3)

Role of the nurse in the teaching of health in the home and in agencies concerned with the prevention of illness. Emphasis on nutrition as a positive approach to the improvement of health throughout the life cycle. Laboratory experience in clinics, homes, and selected community programs.

NURS 314—NURSING IN THE HOME—3 cr. (2 and 3)

The dimensions of caring for the ill in the home; includes early detection, treatment, and the use of resources with emphasis on continuity of care. Laboratory experience with agencies providing home care.

NURS 415—NURSING AS A SOCIAL FORCE—3 cr. (3 and 0)

Role of professional nursing in comprehensive health planning related to changing social forces.

NURS 417—INTENSIVE NURSING—4 cr. (1 and 9)

Nursing in highly stressful situations. Assisting individuals and families in coping with life-threatening experiences. Laboratory experience in the home and acute care facilities.

NURS 419—THE MULTIPROBLEM FAMILY—3 cr. (2 and 3)

Focus on the family as a unit of care. Use of the epidemiologic approach as a tool in understanding conditions influencing the family. Laboratory experience through community care facilities.

NURS 421—HISTORY AND PHILOSOPHY OF NURSING—3 cr. (3 and 0)

Analysis of the development of modern nursing. Emphasis will be placed on how the nursing profession articulates with society and the role of nurses as change agents. Consideration will be given to the legal and ethical implications in nursing practice.

NURS 422—CURRENT RESEARCH IN NURSING—3 cr. (3 and 0)

A study of approaches to problematic situations in nursing, with emphasis on interpretation of findings.

NURS 425—INDEPENDENT STUDY IN NURSING—7 cr. (3 and 12)

Opportunity for in-depth study in an area of special interest in clinical nursing. Laboratory experience arranged.

NUTRITION

Professors: B. D. Barnett, W. A. King, R. F. Wheeler, W. P. Williams, Jr.

Associate Professors: R. F. Borgman, W. V. Chalupa, R. L. Edwards, D. M. Hendricks, D. E. Turk

Assistant Professors: L. Crook, J. J. Jen

(See courses listed under Animal Science, Biochemistry, Dairy Science, Food Science, and Poultry Science)

Nutr 103—Principles of Nutrition—4 cr. (3 and 3)

Nutrition is discussed in relation to the requirement and role of nutrients in mammalian metabolism—nutrition and disease are emphasized. Laboratory exercises demonstrate nutrient assay methods and the importance of selected nutrients in mammalian diets.

Nutr 401—Fundamentals of Nutrition—3 cr. (3 and 0) F

Biochemical and physiological fundamentals of nutrition applicable to domestic animals and man. Considered are digestive processes, and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals and vitamins. Energy metabolism and comparative anatomy and physiology of digestive systems are discussed.

Nutr 601—Fundamentals of Nutrition—3 cr. (3 and 0)

Nutr 801—Topical Problems in Nutrition—1-3 cr.

Nutr 808—Monogastric Nutrition—3 cr. (3 and 0)

Nutr 809—Polygastric Nutrition—3 cr. (3 and 0)

Nutr 812—Metabolism of Nutrients—3 cr. (3 and 0)

Nutr 813—Nutrition Techniques with Large Animals—2 cr. (1 and 3)

Nutr 814—Nutrition Techniques with Laboratory Animals—2 cr. (1 and 3)

Nutr 816—Amino Acids and Protein Nutrition—2 cr. (2 and 0)

Nutr 818—Vitamins and Minerals—4 cr. (3 and 3)

Nutr 851—Nutrition Seminar I—1 cr. (1 and 0)

Nutr 852—Nutrition Seminar II—1 cr. (1 and 0)

Nutr 891—Research—Credit to be arranged.

Nutr 991—Doctoral Research—Credit to be arranged.

PHILOSOPHY

Assistant Professors: J. L. McCollough, D. F. White, Jr.

Instructor: W. M. Pharr, Jr.

Phil 201—Introduction to Philosophy—3 cr. (3 and 0)

An introduction to the basic issues involved in philosophical thinking, with special emphasis upon these issues as they occur in Greek philosophy. The systems of Plato and Aristotle will be considered in some detail.

Phil 211—Philosophy and Current Issues—3 cr. (3 and 0)

An exercise in developing the beginner's philosophic skills and his ability to think critically and reflectively about the problems he encounters. Selections from contemporary writing will be compared with philosophic classics in order to analyze familiar moral and social problems of current importance as well as the intellectual issues underlying many prevailing conflicts of opinion.

PHIL 302—LOGIC—3 cr. (3 and 0)
Introduction to the theory and practice of evaluating arguments; reduction of ordinary language to logical form and the relation of statement and inference; use of the rules of natural deduction and proof of their consistency and completeness for the logic of propositions (truth-functions) and the logic of predicates (quantification).

PHIL 303—PHILOSOPHY OF RELIGION—3 cr. (3 and 0)
An analytical and critical consideration of the philosophical foundations of religion. Such topics as the existence of God, the problem of evil, theism and atheism, prayer, and immortality will be considered.

PHIL 304—INTRODUCTION TO ETHICAL THEORY—3 cr. (3 and 0)
An examination of moral judgment; its concepts, criteria and relations to factual judgment. Classical theories and current issues are searched for an ideal of the good man and the life we prize. Construction of a model theory of obligation, value, justice, and punishment is attempted.

PHIL 305—AESTHETICS—3 cr. (3 and 0)
A study of the function of art in human life along with a consideration of the various philosophical elements involved in art and art criticism. Various historical types of aesthetic theory will be considered. *Prerequisite:* Junior standing or permission of the instructor.

PHIL 309—RELIGIONS OF THE FAR EAST—3 cr. (3 and 0)
A study of the origin, evolution, and contemporary status of Hinduism, Buddhism, Confucianism, and Taoism. *Prerequisite:* Junior standing.

PHIL 312—MODERN PHILOSOPHY—3 cr. (3 and 0)
The development of the modern mind as seen in the Renaissance and Eighteenth Century philosophers. The writings of Hobbes, Locke, Spinoza, Leibnitz, Hume, and Kant will be considered along with the development of Rationalism and Empiricism.

PHIL 318—CONTEMPORARY PHILOSOPHY—3 cr. (3 and 0)
A study of some of the recent schools and movements in philosophy. Pragmatism, Existentialism, Vitalism, Recent Realism, and some of the linguistic schools will be considered.

PHIL 322—SYMBOLIC LOGIC—3 cr. (3 and 0)
A consideration of the necessary logical structure of a very exact language in terms of modern relational logic. Quantification, Truth Functions, Propositional Functions, Properties of Relations, Arguments Involving Relations, and some non-formal logical systems will be considered. *Prerequisite:* Phil 302 or Math 108 or a computer programming course.

PHIL 344—CURRENT ETHICAL THEORY—3 cr. (3 and 0)
An examination of present trends in ethical and meta-ethical theory for their bearing upon the criteria of our judgments of human conduct and character and upon current moral issues. Selected topics from the logic, epistemology, and psychology of ethical judgment will be considered, with review of relevant journal literature. *Prerequisite:* Phil 304 or permission of the instructor.

Phil 422—Mathematical Logic—3 cr. (3 and 0)
A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Phil 322 or sufficient mathematical background.

Phil 425—Philosophy of Science—3 cr. (3 and 0)
A study of the presuppositions, categories, and implications of the physical and social sciences with special reference to the concepts of Space and Time, Matter, Causation, and Relativity. The logic of "scientific method" and the unity of the sciences are considered. *Prerequisite:* Junior standing and permission of the instructor.

Phil 825—Seminar in Philosophy of Science—3 cr. (3 and 0)

PHYSICAL SCIENCE

(Jointly administered by the Chemistry and Physics Departments)

Phy Sc 101—Physical Science I—4 cr. (3 and 2)
An introduction to the physical sciences. Selected topics will be discussed to illustrate the structure and meaning of the physical sciences. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

Phy Sc 102—Physical Science II—4 cr. (3 and 2)
A continuation of Phy Sc 101. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

PHYSICS

Professors: L. D. Huff, M. J. Skove, E. P. Stillwell, H. E. Vogel, *Head*

Associate Professors: P. B. Burt, R. L. Chaplin, Jr., F. J. Keller, W. E. Gettys, J. L. Ging, H. W. Graben, A. L. Laskar, D. P. Miller, M. G. Miller, M. D. Sherrill, K. L. Wood

Assistant Professors: T. F. Collins, J. A. Gilreath, J. R. Manson, J. R. Ray, P. A. Steiner, R. C. Turner, C. W. Ulbrich

Phys 101—Current Topics in Modern Physics—1 cr. (0 and 2)
Demonstrations and lectures supplemented by slides and motion pictures on current topics in physics, such as superfluids, lasers, superconductors, elementary particles, etc., chosen from the fields of atomic, nuclear, solid state physics, and astrophysics. Several members of the staff will participate.

Phys 122—Mechanics and Wave Phenomena—3 cr. (3 and 0)
Vectors; laws of motion; rotation; vibratory and wave motion; mechanical properties of materials. *Prerequisite:* Registration in Math 108.

Phys H122—Mechanics and Wave Phenomena—3 cr. (3 and 0)
Honors section of Phys 122. Open by invitation only.

Phys 132—General Physics for Physics Majors I—3 cr. (3 and 0)
Introduction to physical quantities, linear and rotational motion, conservation laws, gravitational and electric fields, and kinetic theory. *Prerequisite:* Registration in Math 108.

PHYS 205—DESCRIPTIVE ASTRONOMY—3 cr. (3 and 0)

An elementary survey of the astronomical universe primarily for students not majoring in physical science, mathematics or engineering.

PHYS 207—GENERAL PHYSICS—4 cr. (3 and 2)

An introductory course for students who are not majoring in a pure science or engineering. Includes mechanics, light, and astronomy. *Corequisite:* A course that includes trigonometry.

PHYS 208—GENERAL PHYSICS—4 cr. (3 and 2)

Continuation of Phys 207. Includes electricity, magnetism, thermal phenomena, and quantum theory. *Prerequisite:* Phys 207.

PHYS 221—THERMAL AND ELECTRICAL PHENOMENA—3 cr. (3 and 0)

Thermal properties of matter; electric and magnetic fields; electric currents and circuits; motions of charged particles in fields. *Prerequisite:* Phys 122.

PHYS H221—THERMAL AND ELECTRICAL PHENOMENA—3 cr. (3 and 0)

Honors section in Phys 221. Open by invitation only.

PHYS 222—OPTICS AND MODERN PHYSICS—3 cr. (3 and 0)

Theory of light waves and photons; optical instruments; relativity; atomic particles; nuclear physics. *Prerequisite:* Phys 221.

PHYS H222—OPTICS AND MODERN PHYSICS—3 cr. (3 and 0)

Honors section in Phys 222. Open by invitation only.

PHYS 223—ELECTRON PHYSICS LABORATORY—1 cr. (0 and 3)

An introduction to physical experimentation employing the Berkeley A laboratory course. Experiments are performed in acceleration and deflection of electrons, measurement of electron charge to mass ratio by helical motion and time of flight, oscillating systems involving capacitance, resistance and inductance, resonance, modulation, negative resistance and relaxation oscillations. *Prerequisite:* Registration in Phys 221 or 231.

PHYS 224—MODERN PHYSICS LABORATORY—1 cr. (0 and 3)

Continuation of Phys 223. Experiments in the areas of solid state, optical and modern physics. Experiments are performed on electrical carrier mobility in solids, minority carrier lifetime, transistor action, microwave optics, interference and diffraction, light polarizaton, gas laser optics, optical spectra, electron and X-ray diffraction, radioactive particle counting. Compton scattering of X-rays, radioactivity decay and Mossbauer effect. *Prerequisite:* Registration in Phys 222 or 232.

PHYS 231—GENERAL PHYSICS FOR PHYSICS MAJORS II—3 cr. (3 and 0)

A continuation of Phys 132. An introduction to the magnetic field, electric circuits, wave motion, reflection, refraction, diffraction of waves, electromagnetic waves. *Prerequisite:* Phys 132, registration in Phys 223.

PHYS 232—GENERAL PHYSICS FOR PHYSICS MAJORS III—3 cr. (3 and 0)

A continuation of Phys 231. An introduction to thermodynamics, relativity, particle and wave descriptions of matter and light. Includes a description of experiments which were crucial to recent developments in physics. *Prerequisite:* Phys 231, registration in Phys 224.

PHYS 240—PHYSICS OF THE ATMOSPHERIC ENVIRONMENT—3 cr. (3 and 0)
An introduction to meteorological processes with emphasis placed on qualitative descriptions. Includes thermodynamics of the atmosphere, solar radiation and the heat budget, circulation of the atmosphere, force laws governing air mass motions, fronts, condensation processes, synoptic prediction. Special topics would consider the effects of environmental pollution on weather and the effects of weather on health.

PHYS 301—GENERAL ASTRONOMY—3 cr. (3 and 0)
A study of the universe, particularly of the solar system. *Prerequisite:* One year of college physics.

PHYS 302—GENERAL ASTRONOMY—3 cr. (3 and 0)
A study of the sidereal universe of stars, galaxies, etc. *Prerequisite:* Phys 301.

PHYS 305—PHYSICS FOR HIGH SCHOOL TEACHERS I—4 cr. (3 and 3)
Introduction to the fundamental physical notions of time, space, and matter. Motion, optics, and waves discussed. Laboratory experiments form an integral part of the course.

PHYS 306—PHYSICS FOR HIGH SCHOOL TEACHERS II—4 cr. (3 and 3)
Continuation of Physics 305—Newton's laws of motion, universal gravitation, laws of conservation of momentum and of energy. Electricity and magnetism. *Prerequisite:* Phys 305 or permission of instructor.

PHYS 321—MECHANICS I—3 cr. (3 and 0)
Statics; motions of particles and rigid bodies; vibratory motion; gravitation; properties of matter, flow of fluids. *Prerequisite:* Phys 221 or 231.

PHYS 322—MECHANICS II—3 cr. (3 and 0)
Dynamics of particles and of rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. *Prerequisite:* Phys 321 or permission of instructor.

PHYS 325—EXPERIMENTAL PHYSICS I—4 cr. (2 and 6)
Introduction to laboratory techniques, measurement of fundamental constants, and performance of some of the experiments (Stern-Gerlach, Zeeman, Photoelectric, specific charge of electrons and protons, etc.) which are crucial to the development of our present concepts of physics. *Prerequisite:* Phys 321 or equivalent or enrollment in Phys 321 or by permission of the instructor.

PHYS 326—EXPERIMENTAL PHYSICS II—4 cr. (2 and 6)
Continuation of Phys 325.

PHYS 340—ELECTRICITY AND MAGNETISM I—3 cr. (3 and 0)
Electric potential and electrostatic fields; solutions of Laplace's and Poisson's equations; properties of dielectrics and of capacitors; electrostatic energy; current and treatment of circuit problems. Vector analysis is used throughout after introduction. *Prerequisite:* Phys 221 or 231.

PHYS 401—SENIOR THESIS—3 cr. (1 and 6)
The senior thesis is a semi-original piece of work performed under the direction of a member of the physics staff. Theoretical fields available include

relativity, statistical mechanics, nuclear physics and astrophysics. Experimental work may be done in the fields of X-ray diffraction elasticity, low-temperature thermal conductivity, super-conductivity, radiation damage in metals, and electron paramagnetic resonance. *Prerequisite:* At least three physics courses beyond General Physics.

PHYS 402—SENIOR THESIS II—3 cr. (1 and 6)
A continuation of Phys 401.

PHYS 404—ASTRODYNAMICS—3 cr. (3 and 0)
Astronomical coordinate systems, orbit determinations, multiple body problems, perturbations, non-gravitational and relativistic effects and observational theory. Special attention to problems of artificial satellites. *Prerequisite:* Phys 321.

PHYS 432—PHYSICAL OPTICS AND INTODUCTION TO SPECTROSCOPY—3 cr. (3 and 0)
Theory and application of interference and diffraction phenomena, polarized light, magneto-optics and electro-optics. Introductory theory of spectroscopy. *Prerequisite:* Phys 222 or 232.

PHYS 441—ELECTRICITY AND MAGNETISM II—3 cr. (3 and 0)
A continuation of Phys 341. Magnetic fields and energy; magnetic properties of materials; electromagnetic induction; A. C. circuit problems with vector methods and complex numbers; Maxwell's field equations with applications. *Prerequisite:* Phys 341 or equivalent.

PHYS 446—SOLID STATE PHYSICS—3 cr. (3 and 0)
An introductory treatment of the crystal structure of solids and the properties of solids which depend on crystal structure; free electron model of metals; band theory of solids; Brillouin zones, crystalline defects and diffusion. *Prerequisite:* Phys 222 or 232 or permission of instructor.

PHYS 452—INTRODUCTORY NUCLEAR PHYSICS—3 cr. (3 and 0)
Various phases of nuclear physics including natural and induced radioactivity; properties of alpha, beta and gamma-rays; cosmic rays; nuclear energy levels and decay schemes; particle accelerators, fission, fusion and nuclear reactors. *Prerequisite:* Phys 222 or 232.

PHYS 454—NUCLEAR PHYSICS LABORATORY—1 cr. (0 and 3)
Techniques and instruments used in detection and measurement of nuclear radiation. Experiments include half-life determination, absorption measurements, neutron activation, coincidence measurements, decay schemes, and gamma-ray spectroscopy. *Prerequisite:* Registration in Phys 452.

PHYS 455—QUANTUM PHYSICS I—3 cr. (3 and 0)
Discussion of solution of the Schroedinger equation for free particles, the hydrogen atom and the harmonic oscillator. *Prerequisite:* Phys 322 and 341 or permission of instructor.

Phys 456—Quantum Physics II—3 cr. (3 and 0)
Continuation of Physics 455. Application of principles of quantum mechanics as developed in Physics 455 to atomic, molecular, solid state and nuclear systems. *Prerequisite:* Phys 455.

Phys 460—Modern Physics for High School Teachers—3 cr. (3 and 0)
A study of later developments including the measurements of atomic particles. The formulation of new laws and the modifications of old ideas needed to describe the interactions of these particles.

Phys 465—Thermodynamics and Statistical Mechanics—3 cr. (3 and 0)
A study of temperature, development of the laws of thermodynamics and their application to thermodynamic systems. An introduction to low temperature physics is given. *Prerequisite:* Six hours of physics beyond Phys 222 or permission.

Phys 471—Electron Microscopy—3 cr. (2 and 3)
The theory and operation of the electron microscope. Magnetic lens theory. The technique of specimen mounting and the interpretation of electron micrographs and diffraction patterns. Each student may choose specimens from his major field. *Prerequisite:* General Physics, Math 206 and permission of instructor.

Phys 473—X-ray Crystallography—3 cr. (2 and 3)
A study of crystal symmetry, elementary space group theory, diffraction of X-rays by electronic charge distribution. Experimental methods of optical goniometry, powder diffraction and single crystal techniques are used to obtain diffraction intensities from a simple crystalline solid and electron charge distribution is determined. Applications of X-ray diffraction to chemical, physical and metallurgical investigations are discussed.

Phys 604—Astrodynamics—3 cr. (3 and 0)

Phys 605—Physics for High School Teachers I—4 cr. (3 and 3)

Phys 606—Physics for High School Teachers II—4 cr. (3 and 3)

Phys 621—Mechanics I—3 cr. (3 and 0)

Phys 622—Mechanics II—3 cr. (3 and 0)

Phys 625—Experimental Physics I—4 cr. (2 and 6)

Phys 626—Experimental Physics II—4 cr. (2 and 6)

Phys 632—Physical Optics and Introduction to Spectroscopy—3 cr. (3 and 0)

Phys 640—Electricity and Magnetism I—3 cr. (3 and 0)

Phys 641—Electricity and Magnetism II—3 cr. (3 and 0)

Phys 646—Solid State Physics—3 cr. (3 and 0)

Phys 652—Introductory Nuclear Physics—3 cr. (3 and 0)

Phys 655—Quantum Physics I—3 cr. (3 and 0)

Phys 656—Quantum Physics II—3 cr. (3 and 0)

Phys 660—Modern Physics for High School Teachers—3 cr. (3 and 0)

PHYS 665—THERMODYNAMICS AND STATISTICAL MECHANICS—3 cr. (3 and 0)

PHYS 671—ELECTRON MICROSCOPY—3 cr. (2 and 3)

PHYS 673—X-RAY CRYSTALLOGRAPHY—3 cr. (2 and 3)

PHYS 801—PHYSICS FOR HIGH SCHOOL TEACHERS I—3 cr. (3 and 0)

PHYS 802—PHYSICS FOR HIGH SCHOOL TEACHERS II—3 cr. (3 and 0)

PHYS 803—MODERN PHYSICS FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 804—ASTRONOMY FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 811—METHODS OF THEORETICAL PHYSICS I—3 cr. (3 and 0)

PHYS 812—METHODS OF THEORETICAL PHYSICS II—3 cr. (3 and 0)

PHYS 813—ADVANCED THERMODYNAMICS AND STATISTICAL MECHANICS I—3 cr. (3 and 0)

PHYS 814—ADVANCED THERMODYNAMICS AND STATISTICAL MECHANICS II—3 cr. (3 and 0)

PHYS 821—CLASSICAL MECHANICS I—3 cr. (3 and 0)

PHYS 822—CLASSICAL MECHANICS II—3 cr. (3 and 0)

PHYS 841—ELECTRODYNAMICS I—3 cr. (3 and 0)

PHYS 842—ELECTRODYNAMICS II—3 cr. (3 and 0)

PHYS 845—SOLID STATE I—3 cr. (3 and 0)

PHYS 846—SOLID STATE II—3 cr. (3 and 0)

PHYS 853—NUCLEAR PHYSICS I—3 cr. (3 and 0)

PHYS 854—NUCLEAR PHYSICS II—3 cr. (3 and 0)

PHYS 856—CRYSTALLOGRAPHY—3 cr. (3 and 0)

PHYS 875—SEMINAR IN CONTEMPORARY PHYSICS—1 or 2 or 3 cr. (1 or 2 or 3 and 0)

PHYS 885—COLLOQUIUM—1 cr. (1 and 0)

PHYS 891—RESEARCH—Credit to be arranged.

PHYS 922—HYDRODYNAMICS—3 cr. (3 and 0)

PHYS 951—QUANTUM MECHANICS I—3 cr. (3 and 0)

PHYS 952—QUANTUM MECHANICS II—3 cr. (3 and 0)

PHYS 955—ADVANCED MODERN PHYSICS I—3 cr. (3 and 0)

PHYS 956—ADVANCED MODERN PHYSICS II—3 cr. (3 and 0)

PHYS 966—RELATIVITY—3 cr. (3 and 0)

PHYS 991—DOCTORAL RESEARCH AND DISSERTATION—Credit to be arranged.

PLANT PATHOLOGY

Professors: L. W. BAXTER, W. M. EPPS, *Head;* J. E. HALPIN, W. WITCHER
Associate Professor: G. C. KINGSLAND
Assistant Professors: O. W. BARNETT, E. I. ZEHR
Lecturer: W. M. DOWLER [*]

PL PA 401—PLANT PATHOLOGY—3 cr. (2 and 3) F, S
The principles of the interrelationships between plant pathogens, their hosts, and the environment. Economically important plant diseases are used to illustrate these principles and the application of these principles to disease control. *Prerequisite:* Bot 102.

PL PA H401—PLANT PATHOLOGY—3 cr. (2 and 3) F, S
Honors option for Pl Pa 401, admission by special arrangement.

PL PA 405—FOREST PATHOLOGY—3 cr. (2 and 3) F
Principles of plant pathology as related to forest tree diseases; casual agents and their effects on the suscept; prevention and control and minimizing losses; relation of disease control to silviculture, management, and forest products utilization. *Prerequisite:* Bot 102 and Bot 352 or permission of instructor.

PL PA H405—FORESTRY PATHOLOGY—3 cr. (2 and 3) F
Honors option for Pl Pa 405, admission by special arrangement.

PL PA 451—BACTERIAL PLANT PATHOGENS—3 cr. (2 and 3) S, '73 and alternate years.
The nature, development and control of plant diseases caused by bacteria. Taxonomic considerations, host-parasite relations and techniques used in isolating, identifying, and preserving bacterial plant pathogens. *Prerequisite:* Pl Pa 401 or 405, Micro 305, or permission of instructor.

PL PA 456—PLANT VIROLOGY—3 cr. (3 and 0) S, '72 and alternate years
Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector relationships; and serological procedures. The importance and control of plant virus diseases will be discussed. *Prerequisite:* Bot 102.

PL PA H456—PLANT VIROLOGY—3 cr. (3 and 0) S, '72 and alternate years
Honors option for Pl Pa 456, admission by special arrangement.

PL PA 458—PLANT PARASITIC NEMATODES—3 cr. (2 and 3) F, '72 and alternate years.
Morphology and taxonomy of stylet bearing nematodes and their relationship with plant diseases. *Prerequisite:* Bot 102 and Zool 102.

PL PA H458—PLANT PARASITIC NEMATODES—3 cr. (2 and 3) F, '72 and alternate years.
Honors option for Pl Pa 458, admission by special arrangement.

PL PA 601—PLANT PATHOLOGY—3 cr. (2 and 3)

PL PA 605—FOREST PATHOLOGY—3 cr. (2 and 3)

PL PA 651—BACTERIAL PLANT PATHOGENS—3 cr. (2 and 3)

PL PA 656—PLANT VIROLOGY—3 cr. (3 and 0)

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[*] On leave.

PL PA 658—PLANT PARASITIC NEMATODES—3 cr. (2 and 3)

PL PA 800—ADVANCED PLANT PATHOLOGY I—3 cr. (3 and 0)

PL PA 801—ADVANCED PLANT PATHOLOGY II—3 cr. (3 and 0)

PL PA 804—PHYSIOLOGICAL PLANT PATHOLOGY—3 cr. (3 and 0)

PL PA 805—SPECIAL PROBLEMS IN PLANT PATHOLOGY—Credit to be arranged.

PL PA 807—SEMINAR—1 cr. (1 and 0)

PL PA 808—TECHNIQUES AND METHODS IN PLANT PATHOLOGY I—1 cr. (0 and 3)

PL PA 809—TECHNIQUES AND METHODS IN PLANT PATHOLOGY II—1 cr. (0 and 3)

PL PA 811—PLANT DISEASE DIAGNOSIS I—1 cr. (0 and 3)

PL PA 812—PLANT DISEASE DIAGNOSIS II—1 cr. (0 and 3)

PL PA 891—RESEARCH—Credit to be arranged.

PL PA 991—DOCTORAL RESEARCH—Credit to be arranged.

POLITICAL SCIENCE

Associate Professor: J. E. TUTTLE

Assistant Professors: H. E. ALBERT, W. H. OWENS, JR., R. A. RIMKUS, M. W. SLANN

POL SC 101—INTRODUCTION TO POLITICAL SCIENCE I, AMERICAN GOVERNMENT—3 cr. (3 and 0)
A general introduction to public administration, political behavior, and public law, with a concentrated treatment of American institutions. (Formerly Pol Sc 202.)

POL SC 201—INTRODUCTION TO POLITICAL SCIENCE II—3 cr. (3 and 0)
A basic introduction to the study, analysis, scope, and sources of government. Emphasis is given to the comparative institutions of government, the international relations of government, the theoretical conceptions man has entertained about government, and analysis of the ways in which man has behaved in response to government. *Prerequisite:* Pol Sc 101 (or 301) or permission of instructor.

POL SC 301—AMERICAN GOVERNMENT AND POLITICAL PARTIES—3 cr. (3 and 0)
The Constitution: powers and functions of the governmental activities; political parties and elections. Not open to those who have completed Pol Sc 101 or 202.

POL SC 302—STATE AND LOCAL GOVERNMENT—3 cr. (3 and 0)
The structural features, functions, and legislative, executive and judicial processes of American state and local governments.

POL SC 321—GENERAL PUBLIC ADMINISTRATION—3 cr. (3 and 0)
An introduction to public administration including the elements of organization, personnel and financial management, and administrative law and administrative responsibility. *Prerequisite:* Pol Sc 101 (or 301) and 201.

Pol Sc 331—Constitutional Development of the United States—3 cr. (3 and 0)

The origin and growth of the Constitution of the United States. *Prerequisite:* Pol Sc 101 (or 201).

Pol Sc 341—Political Behavior—3 cr. (2 and 3)

An introduction to behavioral methods. Identification of regularities in the type, degree, and direction of political participation. Laboratory training and field work in interviewing. *Prerequisite:* Junior standing and permission of instructor.

Pol Sc 351—Classical Political Thought—3 cr. (3 and 0)

Political philosophy from the pre-Socratic period to Machiavelli. *Prerequisite:* Pol Sc 101 (or 301) and 201.

Pol Sc 352—Modern Political Thought—3 cr. (3 and 0)

The early theories of the nation state in the sixteenth century and the major political thinkers, problems and movements through the twentieth century. *Prerequisite:* Pol Sc 101 (or 301) and 201.

Pol Sc 361—International Politics—3 cr. (3 and 0)

An introduction to foreign policy, international law, and international organizations. *Prerequisite:* Pol Sc 101 (or 301) and 201.

Pol Sc 371—Comparative European Governments I; Constitutional Systems—3 cr. (3 and 0)

Major emphasis on the United Kingdom, France, Germany, and the U.S.S.R., with brief attention given to Italy and Switzerland. Current methods of comparison will be studied and applied to the formal and informal functioning of these governments. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 372—Comparative European Government II; Totalitarian Systems—3 cr. (3 and 0)

A continuation of Pol Sc 371. This course will deal specifically with the Soviet Union as an example of totalitarian political systems, with references made to Nazi Germany and the present Eastern European political systems. *Prerequisite:* Pol Sc 101 (or 301) and 201.

Pol Sc 403—Legislative Process—3 cr. (3 and 0)

Individual behavior and the decision-making process within legislatures; legislative functions; the relationship of legislatures to the Executive and other entities in the political system. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 409—Directed Study in American Institutions—3 cr. (3 and 0)

Supervised reading and/or research in selected areas of American government. *Prerequisite:* 18 semester hours in political science and permission of the instructor.

Pol Sc 422—Problems of Public Administration—3 cr. (3 and 0)

Selected views of public administration and the problems involved. *Prequisite:* Pol Sc 101 or permission of the instructor.

Pol Sc 423—Municipal Administration—3 cr. (3 and 0)

Interaction of political, technical, and administrative processes in urban America. *Prerequisite:* Pol Sc 101 or permission of the instructor.

Pol Sc 432—American Constitutional Law I—3 cr. (3 and 0)
A brief introduction to the judicial process followed by a detailed examination of leading cases pertaining to the Judiciary, the Congress, the Presidency, and the federal system. *Prerequisite:* Pol Sc 101 (or 301), 201, and preferably 331.

Pol Sc 433—American Constitutional Law II—3 cr. (3 and 0)
An examination of the relationship of the individual to his government; focusing on the safeguards of liberty and property including freedoms of speech, press and religion, and criminal procedure. *Prerequisite:* Pol Sc 101 (or 301), 201, and preferably 331.

Pol Sc 434—The Judicial Process and Jurisprudence—3 cr. (3 and 0)
Courts as political subsystems; judicial decision-making; the development of public policy through the judicial process; theories of law and jurisprudence. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 442—Political Parties and Politics—3 cr. (3 and 0)
A study of the historical development of political parties, and the role they play in the organization and functions of our national government, and the influence of politics in policy making. *Prerequisite:* Pol Sc 101 (or 301) and 201.

Pol Sc 443—Public Opinion and Propaganda—3 cr. (3 and 0)
This course examines the nature of public opinion, its social and political context, the social-psychological processes basic to it, the dynamics of its formation and change and its measurement. *Prerequisite:* Pol Sc 341, IM 410, or permission of the instructor.

Pol Sc 462—International Organizations—3 cr. (3 and 0)
Emphasis on international organizations. Analysis of current problems and proposed solutions. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 463—United States Foreign Policy—3 cr. (3 and 0)
Focus on foreign policy in its historical perspective, examining the decision-making process in foreign policy; evaluates contemporary American capabilities, and analyzes specific issues. *Prerequisite:* Pol Sc 101 (or 202 or 301) and 201.

Pol Sc 464—International Law—3 cr. (3 and 0)
An examination of cases and other legal materials on the nature of international law, recognition of states, succession, the territory of states, and nationality. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 469—Proseminar in International Studies—3 cr. (3 and 0)
Assessment of various theories and methods employed in the systematic study of International Relations; class discussions, readings, and reports. *Prerequisite:* Pol Sc 101, 201, and permission of the instructor.

Pol Sc 473—Politics of the Developing Nations—3 cr. (3 and 0)
A comparative analysis of the political and social problems of the developing nations of Africa, the Near East, East Asia and Latin America. *Prerequisite:* Pol Sc 101 and 201 or permission of the instructor.

Pol Sc 632—American Constitutional Law I—3 cr. (3 and 0)

Pol Sc 662—International Organizations—3 cr. (3 and 0)

POULTRY SCIENCE

Professors: B. D. Barnett, *Head;* M. A. Boone

Associate Professors: J. B. Cooper, D. E. Turk

Assistant Professors: J. E. Jones, J. Solis

PS 201—Introduction to Poultry Science—3 cr. (2 and 3) F, S
The application of the physical and biological sciences to modern poultry production and utilization. A study of the anatomy and physiology of the fowl and the economic aspects of poultry enterprises.

PS 354—Poultry Breeding—3 cr. (2 and 3) S, '72 and alternate years.
The application of genetics to the improvement of poultry and a study of the physiology related to breeding. *Prerequisite:* Gen 302.

PS 355—Poultry Products Grading and Technology—3 cr. (2 and 3) F, '71 and alternate years.
Factors important in the quality of poultry products will be considered. The effects of production, handling, packaging and storage on consumer acceptability will be discussed. Quality evaluation will be considered from the standpoint of tenderness, flavor, microbiology, and USDA grades.

PS 356—Incubation and Brooding—2 cr. (2 and 0)
F, '72 and alternate years.
Principles and practice of incubation of chicken, turkey, quail, and waterfowl eggs with consideration of hatchery management and avian embryology.

PS 357—Incubation and Brooding Laboratory—1 cr. (0 and 3)
F, '72 and alternate years.
Demonstration of subjects covered in PS 356. Must be concurrently enrolled in PS 356.

PS 401—Animal Environmental Technology—2 cr. (2 and 0)
F, '72 and alternate years.
Demonstration of measurement and control of certain environmental factors with emphasis on light, temperature, and ventilation. Demonstration of physiological response of animals to different environments. All domestic livestock will be considered.

PS 403—Animal Environmental Technology Laboratory—1 cr.
(0 and 3) F, '72 and alternate years.
Demonstration of subjects covered in PS 401.

PS 451—Poultry Nutrition—2 cr. (2 and 0) S, '72 and alternate years.
Nutrient requirements of the various classes of poultry and the use of feedstuffs in meeting these needs. *Prerequisite:* An Sc 301.

PS 458—Avian Microbiology and Parasitology—4 cr. (3 and 3)
F, '72 and alternate years.
Agents causing poultry diseases; the diagnosis, prevention, and treatment of specific diseases and their economic and public health significance.

PS 460—Seminar—2 cr. (2 and 0) S, '71 and alternate years.
Current research reported in journals covering the various areas of poultry science. Students will practice scientific writing and interpretation of technical material for lay readers. *Prerequisite:* Permission of instructor.

PS 601—Animal Environmental Technology—2 cr. (2 and 0)

PS 603—Animal Environmental Technology Laboratory—1 cr. (0 and 3)

PS 651—Poultry Nutrition—2 cr. (2 and 0)

PS 654—Poultry Breeding—3 cr. (2 and 3)

PS 655—Poultry Products Grading and Technology—3 cr. (2 and 3)

PS 656—Incubation and Brooding—2 cr. (2 and 0)

PS 657—Incubation and Brooding Laboratory—1 cr. (0 and 3)

PS 658—Avian Microbiology and Parasitology—4 cr. (3 and 3)

PS 660—Seminar—2 cr. (2 and 0)

PS 804—Poultry Pathology—3 cr. (1 and 6)

PS 805—Seminar—1 cr. (1 and 0)

PS 891—Research—Credit to be arranged.

PSYCHOLOGY

Associate Professors: C. B. Caffrey, J. D. Davenport, E. E. Waite, Jr.
Assistant Professors: S. N. Cole, T. G. Titus, W. B. Turpin
Lecturer: D. K. Freeman, Jr.

Psych 201—General Psychology—3 cr. (3 and 0)
A survey of the field of psychology: development and adjustment, motivation, emotions, intelligence, personality, the sensory experiences, perception, learning, thinking, imagination and mental hygiene.

Psych 202—Experimental Psychology I—3 cr. (2 and 2)
This course places emphasis on theoretical and practical problems of reporting research. Required of psychology majors (and minors after May, 1969). Not open to those who have had Psych 362. *Prerequisite:* Psych 201.

Psych 211—Growth and Development—3 cr. (3 and 0)
The course will focus on changes in personal and social behavior throughout the human life span. *Prerequisite:* Psych 201.

Psych 302—Social Psychology—3 cr. (3 and 0)
The interaction between the individual and the forces of society: the classical theories, the psychobiological bases of human behavior, the sociocultural bases of behavior, types of human behavior, overt and covert experiences, symbolism, personality and social interaction. *Prerequisite:* Psych 201.

Psych 303—The Psychology of Adjustment—3 cr. (3 and 0)
A course in personal adjustment dealing with the appropriate and inappropriate reactions to frustration and stress, including ways of handling conflicts, anxiety, fears, and the promotion of personal emotional adjustment. *Prerequisite:* Psych 201, 202, or permission of instructor. Not open to psychology majors.

Psych 321—Developmental Psychology—3 cr. (3 and 0)
A survey of current theory and research concerned with the psychological aspects of human growth and development. *Prerequisite:* Psych 201, 202.

Psych 331—Theories of Learning—3 cr. (3 and 0)
An historical approach to the study of the major modern learning theories. *Prerequisite:* Psych 201, 202.

Psych 341—Physiological Psychology—3 cr. (3 and 0)
The study of human neuroanatomy, with an emphasis on the functions of the nervous system. Treats of the biological bases of behavior in both normal and abnormal dimensions.

Psych 351—History and Systems of Psychology—3 cr. (3 and 0)
A treatment of the science of psychology as understood in the light of the ideas of men who have been responsible for its development. *Prerequisite:* Psych 201, 202.

Psych 361—Motivation—3 cr. (3 and 0)
The various aspects of motivation are considered through a study of contributions of biologists, sociologists, anthropologists, and psychologists. The orientation is empirical rather than theoretical, with emphasis on pertinent research and research methods, and on the measurement of motives. *Prerequisite:* Psych 201, 202.

Psych 363—Experimental Psychology II—4 cr. (3 and 3)
A continuation of Experimental Psychology I, with a stress on the carrying out of original research in the scientific study of human and animal behavior. Laboratory periods stress the refinement of techniques and the execution of research in a guided setting. *Prerequisite:* Psych 201, 202.

Psych 380—Cognitive Processes—3 cr. (3 and 0)
The study of higher cognitive functioning which includes such areas as memory, concept acquisition, the acquisition and use of language, speech perception, pattern recognition and problem solving.

Psych 401—Applied Psychology—3 cr. (3 and 0)
A study of the concepts of psychology as applied to individual, business, and professional behavior. *Prerequisite:* Psych 201.

Psych 402—Abnormal Psychology—3 cr. (3 and 0)
Mental and emotional disorders: theories of causation and problems of treatment; special phenomena of consciousness and unconsciousness, *e.g.*, dreams, dissociation, hypnosis; analysis of pathological behavior: alcoholism, drug addiction, suicide, criminality, neurosis, and psychoneurosis. *Prerequisite:* Psych 201.

Psych 403—Personality—3 cr. (3 and 0)
An analysis of the theories of personality: Freud, Adler, Jung, Sullivan, Horney, Allport, *et al.* *Prerequisite:* Psych 201, 202 and permission of instructor.

Psych 422—Cross Cultural Studies in Developmental Psychology—3 cr. (3 and 0)
A comparative study of the development of human behavior and personality emphasizing the contributions of learning theory, psychoanalysis, role theory, and cultural anthropology. *Prerequisite:* Psych 201, 202, 321, 331 or 361, 402 or 403, or permission of the instructor.

Psych 432—Conditioning and Learning—3 cr. (3 and 0)
A comprehensive study of the principles of learning. Includes classical, instrumental, and operant conditioning paradigms. A detailed study of rein-

forcement, acquisition, generalization, discrimination, and extinction of behavioral responses. *Prerequisite:* Psych 201, 202, 331, Math 203.

PSYCH 442—SENSATION AND PERCEPTION—3 cr. (3 and 0)
Current experimental findings in the field of perception and sensation, along with theories of vision, audition, kinesthesis, vestibular function, the skin and chemical senses and theories of perception. *Prerequisite:* Psych 201, 202 and 341.

PSYCH 471—PSYCHOMETRICS—3 cr. (3 and 0)
An introduction to the theory of psychological testing. Emphasis is on essentials of testing with experience in administering, scoring and interpreting test, including those of scholastic achievement, mental ability, scholastic aptitude, interests and personality. *Prerequisite:* Nine hours of psychology including 201, 202).

PSYCH 490—SPECIAL TOPICS IN PSYCHIATRY AND NEUROLOGY, 3 cr. (3 and 0)
Selected aspects of medical sciences related to clinical psychology—psychiatric examination and nosology, central nervous system pathology, psychopharmocology, child psychiatry, etc.—designed to assist the psychologist in working effectively with representatives of these disciplines. *Prerequisite:* Psych 201, 202, 402, 403 and/or permission of the instructor.

PSYCH 495—DIRECTED RESEARCH IN BEHAVIOR—2 cr. (2 and 0)
Consists of individual research projects carried out by students under the direct guidance of a particular faculty member. The research will be conducted in psychology or in a related field, provided that key variables are related to human or animal behavior. *Prerequisite:* Psych 363 completed; status as a senior.

PSYCH 498—SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY—2 cr. (2 and 0)
Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, and 363 or permission of the instructor.

PSYCH 499—SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY II—3 cr. (3 and 0)
Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, and 363, or permission of the instructor.

RECREATION AND PARK ADMINISTRATION

Professor: H. BRANTLEY, *Head*

Associate Professor: J. L. STEVENSON

Assistant Professors: R. M. FRYE, L. W. GAHAN, G. E. HOWARD, SARAH A. WALKER, C. R. WHITE.

Lecturer: J. A. BROADBOOKS

RPA 101—INTRODUCTION TO COMMUNITY RECREATION—3 cr. (3 and 0)
History and foundations of Community Recreation in public, private and commercial settings; job opportunities, specifications and demands.

RPA 102—History and Principles of Outdoor Recreation—3 cr. (3 and 0)

Includes the study of the history, present status and the principles of operation of parks and park systems in America; Outdoor Education Programs; implications for continued growth of this leisure phenomenon.

RPA 203—Personal and Community Health—3 cr. (3 and 0)

The course deals with health problems, disease prevention and control, school health practices, public health administration, and other health information which may enable one to live intelligently in today's complex society.

RPA 204—Sports in Recreation—3 cr. (2 and 3)

Administrative and supervisory skills indigenous to public and/or private agency athletic programs are considered. Group instruction is given in individual and team sports and officiating techniques applicable to these sports are taught.

RPA 205—Program Planning for Recreation—3 cr. (2 and 3)

Course includes fields of activity available to participants; principles and methods of program development; utilization of time-blocks and facilities. (Formerly RPA 303.) *Prerequisite:* Junior standing.

RPA 302—Camp Organization and Administration—3 cr. (2 and 3)

Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables student to master the techniques of group living. Laboratory offers practical experience in camp craft including trips and outdoor cooking.

RPA 304—Recreation in Modern Society—3 cr. (3 and 0)

An historical study of the growth of leisure with special attention given to the utilization of community resources for recreation.

RPA 305—Physical Aspects of Sports in Recreation—3 cr. (2 and 3)

The course considers the physiology of exercise as it relates to safety in recreational sports programs, the practice of first aid, and the treatment of athletic injuries.

RPA 306—Principles of Outdoor Education—3 cr. (3 and 0)

A study of the development of outdoor education in public, private and professional agencies with special emphasis on schools and park and recreation departments. Attention will be focused on our National land problems and on land needs for tomorrow.

RPA 307—Park Maintenance and Operation—4 cr. (3 and 3)

Maintenance techniques and materials, interpretive programs, job planning and scheduling, problems of overuse and preventive maintenance are included. (Formerly RPA 401.)

RPA 308—Methods and Techniques of Recreation Leadership—3 cr. (3 and 0)

Considers characteristics of the several levels of recreation leadership with special emphasis on supervision. Examination is made of the Group Processes. Also includes a study of community resources for leadership in specialized program areas.

RPA 402—Recreation Administration—3 cr. (3 and 0)
An analysis of the internal organization of a recreation department dealing with finances and accounting; records and reports; publicity and public relations; state and federal legislation; staff organization; coordination of community resources. *Prerequisite:* Senior standing.

RPA 403—Facility and Site Planning—3 cr. (2 and 3)
Trends in recreation facility development, planning principles involved in design of recreation buildings, and orientation of facilities to given area are integrated into sound planning programs. *Prerequisite:* RPA 307 or permission of instructor.

RPA 404—Methods of Recreation Research—3 cr. (3 and 0)
An analysis of the principal methods of recreation research; the development of experiments; use of questionnaires; research problem under the guidance of the instructor is developed. *Prerequisite:* Senior standing and Ed 491.

RPA 405—Field Training in Recreation—8 cr.
The student, in a ten-week program, has the opportunity to observe recreation programs in operation. He will also have responsibilities of organizing and conducting activities under supervision. Maintenance and operation of facilities will be observed and practiced. Total of 360 hours required. *Prerequisite:* Senior standing.

RPA 406—Recreation for the Ill and Handicapped—3 cr. (3 and 0)
Surveys the recreational opportunities and benefits available to the ill and handicapped citizens. Designed to provide the student with an awareness of the role of the professional recreator in serving the needs of such special groups as the mentally retarded, cerebral palsied, emotionally disturbed—institutionalized, hospitalized, etc. Particular emphasis will be given to program development applicable to each specific situation.

RPA 408—The Application of Recreation Therapy—3 cr. (3 and 0)
The study of the responsibility and role of the recreator as a member of the therapeutic team.

RELIGION

Assistant Professor: D. F. White, Jr.

Rel 301—The Old Testament—3 cr. (3 and 0)
A survey of books of the Old Testament with special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

Rel 302—A Survey of New Testament Literature—3 cr. (3 and 0)
A study of the books of the New Testament from the standpoint of their occasion, content, literary form and basic theology.

Rel 306—Religions of the West—3 cr. (3 and 0)
A study of the origin, evolution, and contemporary status of Judaism, Christianity, and Islam. *Prerequisite:* Junior standing.

Rel 309—Religions of the Far East—3 cr. (3 and 0)
A study of the origin, evolution, and contemporary status of Hinduism, Buddhism, Confucianism, and Taoism. *Prerequisite:* Junior standing.

RURAL SOCIOLOGY

Professor: W. J. LANHAM, *Head*
Associate Professor: V. A. BOYD
Assistant Professor: E. L. MCLEAN

RS 301—RURAL SOCIOLOGY—3 cr. (3 and 0) F, S

A study of human social relationships as influenced by life in the open country and in small towns and villages including considerations of the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

RS 359—THE COMMUNITY—3 cr. (3 and 0) F

An examination of the sociological aspects of contemporary communities and of their growth and development. The structural relations of social class, status and power and the relationships among social institutions within the community are examined. Emphasis is placed on the organization and development of communities in a constantly changing environment.

RS 461—RURAL LEADERSHIP—3 cr. (3 and 0) S

A consideration of the social and psychological factors involved in leadership including an examination and analysis of characteristics of the successful leader. Particular attention is paid to the role of the leader in the process of economic and social development of rural communities and small towns.

RS 659—THE COMMUNITY—3 cr. (3 and 0)

RS 661—RURAL LEADERSHIP—3 cr. (3 and 0)

RS 801—RURAL SOCIAL SYSTEMS—3 cr. (3 and 0)

RUSSIAN

Lecturer: LUDMILA A. SAVITSKY

RUSS 101—ELEMENTARY RUSSIAN—3 cr. (3 and 1)

Training in pronunciation, grammatical forms, and syntax with a view of giving the student the fundamentals necessary to read simple Russian texts. Three hours a week classroom instruction and one hour a week in the language laboratory.

RUSS 102—ELEMENTARY RUSSIAN—3 cr. (3 and 1)

A continuation of Russ 101; three hours a week classroom instruction and one hour a week in the language laboratory.

RUSS 201—INTERMEDIATE RUSSIAN—3 cr. (3 and 1)

The reading of simple Russian prose; a review of grammar and syntax. Drill on vocabulary and idiom. Three hours a week classroom instruction and one hour a week in the language laboratory. *Prerequisite:* Russ 101 and 102.

RUSS 202—INTERMEDIATE RUSSIAN—3 cr. (3 and 0)

A continuation of Russ 201.

SOCIOLOGY

Professor: F. A. Burtner

Assistant Professors: W. C. Capel, Jr., R. J. Knapp, G. S. Rent

Instructors: K. D. Birtman, R. N. Pippin, D. A. Smith

Soc 201—Introductory Sociology—3 cr. (3 and 0)

The basic principles of sociology: culture, biological factors, the influence of geographical environment, human nature, group life, social stratification, communities, social institutions and social change. *Prerequisite:* Sophomore standing.

Soc 202—Social Problems—3 cr. (3 and 0)

A survey of the major social problems, including problems of industry, education, religion, disease and public health, poverty, dependency and factors affecting social adjustment. Required of all students presenting Sociology as the primary or secondary field of concentration. *Prerequisite:* Soc 201.

Soc 306—Contemporary Socio-environmental Problems—3 cr. (2 and 2)

A multidisciplinary study of national, social and environmental issues. Topics will include: regional population concerns, housing needs, regional health problems, the environment—air, water, land—delivery of justice, automation and technological change. *Prerequisite:* Junior standing or consent of instructor.

Soc 311—The Family—3 cr. (3 and 0)

The family as one of the basic institutions of society. The history of the family, and a study of its functions in early and modern social structures. A comparative study of family life in other cultures is made. *Prerequisite:* Soc 201, 202.

Soc 321—Cultural Anthropology—3 cr. (3 and 0)

Recent and contemporary man, as a social and culture-bearing animal, with emphasis on the constants and variants in human behavior involved in technology, social relations, language, religion, art, and other aspects of cultures. *Prerequisite:* Soc 201, 202.

Soc 322—Cultural Anthropology—3 cr. (3 and 0)

A continuation of Sociology 321. *Prerequisite:* Soc 321.

Soc 324—Social and Cultural Change—3 cr. (3 and 0)

An examination of theory and research on the processes of change; factors inducing or inhibiting change; the character, mechanisms, rate, extent, direction, and relative stabilization of change at different levels of social phenomena. *Prerequisite:* Soc 201, 202.

Soc 331—Urban Sociology—3 cr. (3 and 0)

A survey of the history and development of modern urban organization; rise of the city; problems of modern urban life. *Prerequisite:* Soc 201, 202 (for Sociology majors and minors).

Soc 341—Population Analysis—3 cr. (3 and 0)

An analysis of population growth and distribution and their bearing on current economic, political, and social problems. *Prerequisite:* Soc 201, 202.

Soc 351—Industrial Sociology—3 cr. (3 and 0)
Industry as a social organization; the factory as a social system; personality in industrial relations; power groupings within industry; and industry and the community. *Prerequisite:* Soc 201 and permission of the instructor.

Soc 361—Collective Behavior—3 cr. (3 and 0)
Examination of the nature, development and consequences of human behavior in situations where usual social norms and behavior do not apply. Particular attention to such collective behavior phenomena as crowds, mobs, mass, cults, publics, and the initial states of social movements. *Prerequisite:* Soc 201, 202.

Soc 371—Research Methods—3 cr. (3 and 0)
Analysis of scientific methods in social research and consideration of various techniques, methodological approaches and research designs. Required of all Sociology majors. *Prerequisite:* Soc 201, 202, Ex St 301.

Soc 381—Society and Socialization—3 cr. (3 and 0)
The relationship between social structure and personality. *Prerequisite:* Soc 201, 202.

Soc 391—Sociology of Deviant Behavior—3 cr. (3 and 0)
Analysis of advanced theory and research on the social processes by which behavior becomes defined as deviant, the conditions promoting such behavior, and the career patterns of deviant persons. *Prerequisite:* Soc 201, 202.

Soc 411—Classical Sociological Theory—3 cr. (3 and 0)
A survey of sociological theory from Comte to Durkheim. Required of all sociology majors. *Prerequisite:* 9 semester hours in sociology.

Soc 421—Contemporary Sociological Theory—3 cr. (3 and 0)
A survey of sociological theory from Durkheim to the present. Required of all sociology majors. *Prerequisite:* Soc 201, 202, 411.

Soc 431—Complex Organizations—3 cr. (3 and 0)
An examination and comparison of theories of formal organization; and analysis of the structure and function of specific organizations illustrating various theoretical approaches. *Prerequisite:* Soc 201, 202.

Soc 441—Social Stratification—3 cr. (3 and 0)
Analysis of social structure in terms of class, status, prestige, rank and function. Attention is given to the social role of the elite, bureaucracies, the professional, and middle classes. *Prerequisite:* Soc 201, 202.

Soc 451—Sociology of Medicine—3 cr. (3 and 0)
Consideration of the major contributions of sociology to medicine; an exploration of patterned social relationships in the field of health and medicine. *Prerequisite:* Soc 201, 202.

Soc 481—Race Relations—3 cr. (3 and 0)
The study of the problem of racial and ethnic groups in adjusting to American society. The nature and causes of prejudice and discrimination. Programs for the reduction of intergroup tensions and conflicts are evaluated in the light of observed facts and sociological principles. *Prerequisites:* Soc 201, 202 (or permission of the instructor).

Soc 499—Seminar in Selected Topics in Contemporay Sociology—3 cr. (3 and 0)

Required of all sociology majors. *Prerequisite:* Soc 201, 202, 411, 421, or permission of senior adviser.

Soc 611—Classical Sociological Theory—3 cr. (3 and 0)

Soc 621—Contemporary Sociological Theory—3 cr. (3 and 0)

Soc 631—Complex Organizations—3 cr. (3 and 0)

Soc 641—Social Stratification—3 cr. (3 and 0)

Soc 651—Sociology of Medicine—3 cr. (3 and 0)

SPANISH

Assistant Professors: G. J. Fernandez, R. F. Mixon, P. F. Parrado, L. E. Seamon, J. M. Whitmire

Instructors: B. G. Durham, L. T. Perry

Lecturer: Elena G. Fernandez

Span 101—Elementary Spanish—3 cr. (3 and 1)

A course for beginners in which the essentials of grammar are taught and a foundation is provided for a conversational and reading knowledge of the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Span H101—Elementary Spanish—3 cr. (3 and 1)

Honors section of Span 101; admission by invitation.

Span 102—Elementary Spanish—3 cr. (3 and 1)

A continuation of Span 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

Span H102—Elementary Spanish—3 cr. (3 and 1)

Honors section of Span 102; admission by invitation.

Span 201—Intermediate Spanish—3 cr. (3 and 1)

Grammar, vocabulary, and idioms; conversation, composition, and translation. Three hours a week classroom instruction and one hour a week in the language laboratory. *Prerequisite:* Span 102.

Span H201—Intermediate Spanish—3 cr. (3 and 1)

Honors section of Span 201; admission by invitation.

Span 202—Intermediate Spanish—3 cr. (3 and 0)

Introduction to Spanish literature: representative short stories, essays, novels, poetry, and plays. *Prerequisite:* Span 201.

Span H202—Intermediate Spanish—3 cr. (3 and 0)

Honors section of Span 202; admission by invitation.

Span 303—Survey of Spanish Literature I—3 cr. (3 and 0)

Literary movements, influences, and authors from the beginnings to the end of the seventeenth century. Representative works, discussions. Required of Spanish majors. *Prerequisite:* Span 201 and 202.

SPAN 304—SURVEY OF SPANISH LITERATURE II—3 cr. (3 and 0)
Literary movements, influences, and authors from the eighteenth century to the present. Required of Spanish majors. *Prerequisite:* Span 201 and 202.

SPAN 305—CONVERSATIONAL SPANISH—3 cr. (3 and 0)
Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Some written work to increase accuracy. Required of Spanish majors. Assignments in the language laboratory. *Prerequisite:* Span 201 and 202.

SPAN 306—ADVANCED CONVERSATION WITH COMPOSITION—3 cr. (3 and 0)
A continuation of Span 305 with more emphasis on written Spanish. *Prerequisite:* Span 305.

SPAN 307—SPANISH CIVILIZATION—3 cr. (3 and 0)
A study of the significant aspects of the culture of Spain from its origins to the present. *Prerequisite:* Span 202 or permission.

SPAN 308—SPANISH AMERICAN CIVILIZATION—3 cr. (3 and 0)
A study of the significant aspects of the culture of Spanish American countries from the colonial period to the present. *Prerequisite:* Span 202 or permission.

SPAN 401—CONTEMPORARY SPANISH LITERATURE—3 cr. (3 and 0)
Literary trends and representative authors since 1898. *Prerequisite:* Span 303 or 304.

SPAN 402—CONTEMPORARY SPANISH DRAMA—3 cr. (3 and 0)
The Spanish theater from Benavente to the present. *Prerequisite:* Span 303 or 304.

SPAN 405—NINETEENTH CENTURY SPANISH LITERATURE—3 cr. (3 and 0)
Representative authors and movements of the nineteenth century; romanticism, *costumbrismo,* and the regional novel. *Prerequisite:* Span 303 and 304.

SPAN 406—CERVANTES AND THE GOLDEN AGE—3 cr. (3 and 0)
A study of Cervantes and the theater of the Golden Age of Spanish literature. *Prerequisite:* Span 303 or 304.

TECHNICAL OPERATIONS

Professor: E. LAITALA, *Program Director*

TO 301—MECHANICS I—3 cr. (2 and 3)
A study of statics including force systems and friction, dynamics of particles and rigid bodies; and, kinetics including forces, mass and acceleration, work and energy, impulse and momentum. *Prerequisite:* Phys 208, concurrent registration in Math 206.

TO 302—MECHANICS II—3 cr. (2 and 3)
Mechanical properties of solids and fluids. Stress analysis in solids; beams, columns and cylinders. Hydrostatic systems. Energy and flow characteristics of fluid dynamic systems. *Prerequisite:* TO 301.

TO 311—Electrical Circuits I—3 cr. (3 and 0)
A study of direct and alternating current circuits. Circuit theorems are introduced in the direct current coverage and are reinforced during the study of alternating currents. Emphasis is placed on steady state conditions and power relationships in circuits with sinusoidal excitations. *Prerequisite:* Phys 208, concurrent registration in Math 206.

TO 312—Electrical Circuits II—3 cr. (3 and 0)
Continuation of Electrical Circuits I. A thorough coverage of polyphase circuits is included. *Prerequisite:* TO 311.

TO 321—Heat Power I—3 cr. (3 and 0)
First and second laws of thermodynamics, thermodynamic properties, gas mixtures and thermodynamic processes. *Prerequisite:* Phys 208, concurrent registration, Math 206.

TO 322—Heat Power II—3 cr. (3 and 0)
Internal combustion engines, gas turbines, air compressors, flow in nozzles, refrigeration and steam power plant cycles, and heat transfer. *Prerequisite:* TO 321.

TO 331—Heat Power Laboratory—1 cr. (0 and 3)
The course is intended to illustrate theory covered in heat power and in air conditioning; to develop experimental technique; to interpret data and results; and to develop basic skills in technical report writing. *Prerequisite:* TO 321 and registration in TO 322.

TO 341—Kinematics of Machines—2 cr. (1 and 3)
A study of displacements, velocities, and accelerations encountered in the design of machines using the graphical approach to the solution of problems. The use of these principles applied to the study of cams, gears, and miscellaneous mechanisms. *Prerequisite:* TO 301.

TO 411—Electrical Machinery—3 cr. (3 and 0)
Coverage includes the theory of operation and application of D-C and A-C machines and transformers. External characteristics are depicted from the machine equivalent circuit. *Prerequisite:* TO 312.

TO 412—Elements of Electronics—2 cr. (2 and 0)
Theory and operation of electronic circuits and control with emphasis on equipment for industrial application. *Prerequisite:* TO 311.

TO 421—Heating and Air Conditioning—2 cr. (2 and 0)
Psychrometric properties and processes; heating and cooling load calculations; selection and layout of major equipment for heating systems and air conditioning systems, refrigeration and automatic controls. *Prerequisite:* TO 322.

TO 431—Electrical Laboratory—1 cr. (0 and 3)
A laboratory course designed to complement instruction in TO 311, TO 312, and TO 411. *Prerequisite:* TO 311, TO 312, and concurrent registration in TO 411.

TO 441—Machine and Component Design—3 cr. (2 and 3)
Basic instruction in the design and analysis of machine and machine components with emphasis on realistic and functional application.

Kinematic and dynamic characteristics of the mechanical system together with wear, fatigue, structural soundness, safety, etc., will be a major consideration of the analysis. *Prerequisite:* TO 302, TO 341.

TEXTILE CHEMISTRY

Professors: T. D. Efland, J. C. Hubbard, F. T. Simon

Associate Professors: R. H. Barker, J. L. Lundberg, *Head;* D. W. Lyons, E. S. Olson, J. J. Porter, C. W. Roberts

TC 303—Textile Chemistry—3 cr. (3 and 0)

A study of the properties and reactions of aliphatic and aromatic organic compounds. Emphasis will be placed on mechanistic interpretations and the development of synthetic schemes leading to polyfunctional compounds of the types encountered in the textile industry. *Prerequisite:* Ch 102, Math 206.

TC 304—Textile Chemistry—3 cr. (3 and 0)

Fundamental principles of physical and organic chemistry with emphasis on those areas most frequently encountered in the textile industry including thermodynamics, kinetics, and solution properties. These concepts will be applied to the study of aliphatic organic compounds and organic reaction mechanisms. The basic principles of stereochemistry and conformational analysis will be developed. *Prerequisite:* TC 303.

TC 305—Textile Chemistry Laboratory—1 cr. (0 and 3)

An introduction to the techniques used in the synthesis and characterization of organic compounds. To be taken concurrently with TC 303.

TC 306—Textile Chemistry Laboratory—1 cr. (0 and 3)

The techniques used in the synthesis of organic compounds and the measurement of their physio-chemical properties. To be taken concurrently with TC 304.

TC 315—Introduction to Polymer Science and Engineering—3 cr. (3 and 0)

The chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Kinetics of polymerization, molecular characterization, structure, morphology, and mechanical properties of polymers are studied demonstrating design of polymer systems for end use in textiles.

TC 316—Chemical Preparation of Textiles—3 cr. (2 and 3)

The chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers. Colloidal and surface active properties of various compounds and the fundamental factors influencing these properties. *Prerequisite:* TC 315.

TC 317—Polymer and Fiber Laboratory—1 cr. (0 and 3)

High polymers, prepared from monomers, are characterized and spun to make fibers. Chemical and physical properties of fiber forming polymers are measured as functions of parameters critical to properties of textiles.

TC 457—Dyeing and Finishing I—3 cr. (3 and 0)

A study of the different classes of dyestuffs and the chemistry of their applications to different fibers. The theories, principles and mechanisms for the dyeing of textile fibers and fabrics will be presented as well as the reaction mechanisms of various finishing agents applied to different substrates. *Prerequisite:* TC 315.

TC 458—Dyeing and Finishing II—3 cr. (3 and 0)
The kinetics and equilibria of dyeing processes. The use of conductivity, diffusion and other methods useful for measuring absorption isotherms and dyeing rates and the general thermodynamic relationships applicable to dyeing operations. Fiber properties such as zeta potential dye sites, relative amorphous area available will be included.

TC 459—Dyeing and Finishing Laboratory I—1 cr. (0 and 3)
To be scheduled concurrently with TC 457. The course will introduce the student to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations.

TC 460—Dyeing and Finishing Laboratory II—1 cr. (0 and 3)
To be scheduled concurrently with TC 458. The course will cover finishing in addition to dyeing operations and their instrumental control.

TC 461—Seminar and Research—3 cr. (1 and 6)
An original investigation of a problem in textile or polymer chemistry under the direct supervision of a faculty member. After completing his experimental work, the student prepares a formal, written report which he defends before the textile faculty. *Prerequisite:* Senior standing or permission of the instructor.

TC 466—Textile Unit Operations—3 cr. (3 and 0)
Designed to cover some of the principles behind textile equipment operation such as heat transfer in drying and dyeing processes and fluid flow in pressure and open dye operations and polymer production.

TC 475—Cellulose Chemistry—2 cr. (2 and 0)
The organic chemistry of cellulose and its derivatives is developed from the basic principles of carbohydrate chemistry. Emphasis is placed in the substitution and degradation reactions which are of particular importance in textile applications. Fiber morphology is treated in relation to its effect on textile chemical processing. *Prerequisite:* TC 315 or permission of instructor.

TC 615—Introduction to Polymer Science and Engineering—3 cr. (3 and 0)

TC 616—Chemical Preparation of Textiles—3 cr. (2 and 3)

TC 657—Dyeing and Finishing I—3 cr. (3 and 0)

TC 658—Dyeing and Finishing II—3 cr. (3 and 0)

TC 659—Dyeing and Finishing Laboratory I—1 cr. (0 and 3)

TC 666—Textile Unit Operations—3 cr. (3 and 0)

TC 675—Cellulose Chemistry—2 cr. (2 and 0)

TC 811—Polymer Science I—3 cr. (3 and 0)

TC 812—Polymer Science II—3 cr. (3 and 0)

TC 821—Chemistry of Natural Polymers—3 cr. (3 and 0)

TC 831—The Physical Chemistry of Dyeing—3 cr. (3 and 0)

TC 891—Research—Credit to be arranged.

TEXTILE SCIENCE

Professors: T. D. Efland, J. C. Hubbard, Jr., F. T. Simon, J. V. Walters

Associate Professors: J. L. Lundberg, *Head;* D. W. Lyons, J. H. Marvin, Jr., E. S. Olson, J. J. Porter

Assistant Professors: T. H. Gunter, E. A. Vaughn

Visiting Associate Professor: H. M. El-Behery

Text 122—Introduction to Textiles—1 cr. (1 and 0)

An introduction to the various areas involved in the scientific processing of fibrous materials, and the production of yarns and fabrics. The finishing, fabrication and market potential textile materials.

Text 301—Fiber Processing I—3 cr. (2 and 3)

A study of fibrous materials and their relationship to the fiber processing systems. The objectives, theories, principles, and mechanisms of the machines used in the earlier stages of fiber processing. The course is directed primarily to the staple fiber processing systems. Mechanical and mathmetical fundamentals are applied to the machines concerned.

Text 302—Fiber Processing II—3 cr. (2 and 3)

Continuation of Text 301 emphasizing the later stages of fiber processing for the ultimate yarn strand. *Prerequisite:* Text 301.

Text 305—Basic Fibers—3 cr. (3 and 0)

A thorough survey of the origin, characteristics and properties of various textile fibers, both natural and man-made. The classification, identification, and the principal fields of applications will be studied.

Text 306—Yarn Formation—3 cr. (3 and 0)

A fundamental study of the various systems of yarn formation from natural and man-made fibers and their blends. The course provides for the basic understanding of machines, theories and operations.

Text 311—Fabric Development I—3 cr. (2 and 3)

A study of the basic theory underlying the operation of the primary and secondary motions of the cam loom weaving machine. Students learn the principles of designs of the basic plain, twill, and sateen fabrics; and other weaves derived from these basic weaves. Special weaves such as the honeycomb, the mock leno, and the huckaback weave. Weave analysis and preparation of necessary drafts are essential parts of the study of elementary textile design.

Text 312—Fabric Development II—3 cr. (2 and 3)

A study of the theory and operation of the dobby head, Knowles head, Staubli dobby, Jacquard head, and multi-color selection for the above looms. Weave design for compound fabrics using two or more systems of warp and filling threads for three dimensional weaves, weave analysis, and preparation drafts are covered. *Prerequisite:* Text 311.

Text 313—Fabric Formation—3 cr. (3 and 0)

An examination of the theories involved in the assembly of fibers and yarns into fabrics. The application of design, analysis and production of woven, knitted and non-woven fabrics. A brief survey of the fabric producing machines.

TEXT 314—DYEING AND FINISHING—3 cr. (3 and 0)
The concepts of current procedures and future trends in the textile finishing industry are examined. The preparation of fabrics, dye processes and the application of various materials used in the finishing process are presented.

TEXT 321—FIBER SCIENCE—3 cr. (2 and 3)
Fiber properties and the scientific evaluation of these properties. Dimensional, mechanical, optical, electrical, thermal, and moisture relationships are established and investigated.

TEXT 322—PROPERTIES OF TEXTILE STRUCTURES—3 cr. (2 and 3)
Yarn and fabric properties, their scientific significance and analysis. Dimensional, structural, and mechanical interrelationships are established and evaluated.

TEXT 324—TEXTILE STATISTICS—3 cr. (3 and 0)
An introduction to statistics with particular application to the Textile Industry. Measures of central value and variation, probability, the normal curve, tests of hypotheses, elementary correlation and regression. *Prerequisite:* Junior standing.

TEXT 333—THE TEXTILE ARTS—3 cr. (2 and 3)
A survey of the textile arts from prehistoric times to the present with emphasis on the correlation between man's accomplishments in these arts and his progress from the simple tools of ancient origin to the automated systems currently employed in industry.

TEXT 401—POLYMER AND FIBER MECHANICS—3 cr. (3 and 0)
Study of elasticity theory and viscoelasticity applied to polymers and extended to non-linear behavior of fibers and non-linear rheological behavior of polymers with application to extrusion and fiber spinning.

TEXT 403—FIBER PROCESSING III—3 cr. (2 and 3)
The concepts of current fiber processing machines, techniques, practices, and their validity are investigated. Student group and individual problems are assigned that require use of acquired knowledge, textile testing equipment, and processing machines. Study and examination of the cause and effect relations of fibrous material properties and processing dynamics on the fiber assemblies produced. *Prerequisite:* Text 301 and 302.

TEXT 404—FIBER PROCESSING IV—3 cr. (2 and 3)
Continuation of Text 403 with respect to the various fiber assemblies and yarn structures encountered in the fiber processing systems. Emphasis is placed on the machines and their fiber assemblies. *Prerequisite:* Text 301, 302, and 403.

TEXT 411—FABRIC DEVELOPMENT III—3 cr. (2 and 3)
A study of specifications and loom details for the production of fabrics woven to the customer's order to include multi-color layouts. Warp and filling preparation are covered as well as size formulations and their methods of application. Warping and dressing plans are developed for warper and the slasher. *Prerequisite:* Text 312.

TEXT 412—FABRIC DEVELOPMENT IV—3 cr. (2 and 3)
A study of factors that a designer or fabric developer must consider in making of new fabrics or designs. Factors and how they control the con-

struction of cloth, blending of natural and synthetic fibers and the functional use they impart to fabrics, Worth Street rules to govern the selling and buying of cloth, cloth order and loom assignment problems, and analysis of woven fabrics to obtain necessary construction details. Students produce a fancy fabric in the laboratory. *Prerequisite:* Text 411.

TEXT 413—FABRIC DEVELOPMENT V—3 cr. (2 and 3)
Designing and development of fabrics from the leno mechanism, the Jacquard head motion, and the plush loom including tufting and weaving techniques for carpets. Each student will develop an original Jacquard design, prepare and punch cards, and produce the fabric.

TEXT 414—NON-WOVEN AND KNITTED STRUCTURES—3 cr. (3 and 0)
A survey of non-woven and knitted structures dealing with the principles and mechanisms involved. Various systems are covered with emphasis on yarn requirements and fabric properties.

TEXT 421—TEXTILE COSTING I—3 cr. (2 and 3)
Actual and standard cost principles as they apply to the manufacture of textiles. Allocating the cost of material, labor and overhead; determining the cost of individual yarns and fabrics; valuing the inventory; making of cost reports, payroll analysis and the use of data processing. *Prerequisite:* Acct 201 and Senior standing or permission of instructor.

TEXT 426—INSTRUMENTATION—3 cr. (3 and 0)
The principles of industrial and process instrumentation and process control. Static and dynamic characteristics of measurement devices. Transducer techniques for measurement of physical properties such as pressure, temperature, flow, weight, etc. Principles of process controllers.

TEXT 428—TEXTILE RESEARCH—0 to 3 cr.
An original investigation of a problem in textile, fiber, or polymer science under the direct supervision of a faculty member. After completing his experimental work, the student prepares a formal, written report which he defends before the textile faculty. *Prerequisite:* Senior standing or permission of the instructor.

TEXT 429—TEXTILE RESEARCH—0 to 3 cr.
Same as Text 428.

TEXT 440—COLOR SCIENCE—3 cr. (2 and 3)
The application of the science of color to industrial practice in textiles, plastics, paints, lighting and ceramics. The laboratory work will be performed on modern instruments and computers.

TEXT 460—TEXTILE PROCESSES—3 cr. (3 and 0)
Survey of machinery and processes of textile manufacturing from fiber formation through fabric finishing. (For students with a non-textile background.)

TEXT 475—TEXTILE MARKETING—3 cr. (3 and 0)
An examination of the activities involved in the distribution of textile products in today's market. Emphasis will be placed on the role of consumer research and the analysis of fashion in the design and promotion of textile products.

TEXT 601—POLYMER AND FIBER MECHANICS—3 cr. (3 and 0)

TEXT 603—FIBER PROCESSING III—3 cr. (2 and 3)

TEXT 604—FIBER PROCESSING IV—3 cr. (2 and 3)

TEXT 611—FABRIC DEVELOPMENT III—3 cr. (2 and 3)

TEXT 612—FABRIC DEVELOPMENT IV—3 cr. (2 and 3)

TEXT 621—FIBER SCIENCE—3 cr. (2 and 3)

TEXT 622—PROPERTIES OF TEXTILE STRUCTURES—3 cr. (2 and 3)

TEXT 626—INSTRUMENTATION—3 cr. (3 and 0)

TEXT 640—COLOR SCIENCE—3 cr. (2 and 3)

TEXT 660—TEXTILE PROCESSES—3 cr. (3 and 0)

TEXT 821—FIBER PHYSICS I—3 cr. (3 and 0)

TEXT 822—FIBER PHYSICS II—3 cr. (3 and 0)

TEXT 830—TEXTILE PHYSICS—3 cr. (3 and 0)

TEXT 835—TEXTILE STRUCTURES I—3 cr. (3 and 0)

TEXT 836—TEXTILE STRUCTURES II—3 cr. (3 and 0)

TEXT 837—COMPOSITE STRUCTURES—3 cr. (3 and 0)

TEXT 840—SPECTROPHOTOMETRY—3 cr. (3 and 0)

TEXT 866—FIBER FORMATION—3 cr. (3 and 0)

TEXT 870—ADVANCES IN TEXTILE MANUFACTURING—3 cr. (3 and 0)

TEXT 880—SELECTED TOPICS—3 cr. (3 and 0)

TEXT 891—RESEARCH—Credit to be arranged.

VISUAL STUDIES

Professor: R. H. HUNTER, *Head*

Associate Professors: J. T. ACORN, I. G. REGNIER, S. WANG

VIS 203—VISUAL ARTS STUDIO—2 cr. (0 and 6)

Studio work in visual elements and their organization; form, line, texture, space, light and color. Principles of design and formal organization of visual arts. *Prerequisite:* Permission of instructor.

VIS 205—DRAWING—2 cr. (0 and 6)

Studio work in drawing and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

VIS 207—BEGINNING PAINTING—2 cr. (0 and 6)

Studio work in painting and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of the instructor.

VIS 209—BEGINNING SCULPTURE—2 cr. (0 and 6)

Studio work in sculpture and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

VIS 211—BEGINNING PRINTMAKING—2 cr. (0 and 6)

Studio work in lithography, silk screen, wood cuts, and graphics and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

Vis 213—Beginning Photography—2 cr. (0 and 6)
Studio work in photography and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

Vis 215—Beginning Graphics—2 cr. (0 and 6)
Studio work in graphic composition, letterpress, photo lithography, silk screen process and related media. *Prerequisite:* Arch 102 or Vis 203 or permission of instructor.

Vis 305—Life Drawing—2 cr. (0 and 6)
Studio work in drawing and related material. *Prerequisite:* Vis 205, or Vis 207, or Vis 209.

Vis 306—Life Drawing—2 cr. (0 and 6)
Continuation of Vis 305. *Prerequisite:* Vis 305.

Vis 307—Painting—2 cr. (0 and 6)
Studio work in painting and related media. *Prerequisite:* Vis 207.

Vis 308—Painting—2 cr. (0 and 6)
Continuation of Vis 307. *Prerequisite:* Vis 307.

Vis 309—Sculpture—2 cr. (0 and 6)
Studio work in sculpture and related media. *Prerequisite:* Vis 209.

Vis 310—Sculpture—2 cr. (0 and 6)
Continuation of Vis 309. *Prerequisite:* Vis 309.

Vis 311—Printmaking—2 cr. (0 and 6)
Studio work in lithography, silk screen, etching, wood cuts and related media. *Prerequisite:* Vis 211.

Vis 312—Printmaking—2 cr. (0 and 6)
Continuation of Vis 311. *Prerequisite:* Vis 311.

Vis 313—Photography—2 cr. (0 and 6)
Studio work in still photography and related media. *Prerequisite:* Vis 213.

Vis 314—Photography—2 cr. (0 and 6)
Continuation of Vis 313. *Prerequisite:* Vis 313.

Vis 315—Graphics—2 cr. (0 and 6)
Studio work in graphic composition, letterpress, photo lithography, silk screen process, and related media. *Prerequisite:* Vis 215.

Vis 316—Graphics—2 cr. (0 and 6)
Continuation of Vis 316. *Prerequisite:* Vis 316.

Vis 317—Beginning Ceramic Arts—2 cr. (0 and 6)
Applied studio work in ceramic sculpture and pottery; creative experience in process of forming, decorating, glazing, and firing. *Prerequisite:* Cr Ar 101.

Vis 318—Ceramic Arts—2 cr. (0 and 6)
Continuation of Vis 317. *Prerequisite:* Vis 317.

Vis 405—Drawing—3 cr. (0 and 9)
Studio work in advanced drawing and related media. *Prerequisite:* Vis 306 or Vis 308 or Vis 312 or Vis 316.

Vis 406—Drawing—3 cr. (0 and 9)
Continuation of Vis 405. *Prerequisite:* Vis 405.

Vis 407—Painting—3 cr. (0 and 9)
Studio work in advanced painting and related media. *Prerequisite:* Vis 308 or Vis 312 or Vis 314, Vis 316.

Vis 408—Painting—3 cr. (0 and 9)
Continuation of Vis 407. *Prerequisite:* Vis 407.

Vis 409—Sculpture—3 cr. (0 and 9)
Advanced studio work in sculpture and related media. *Prerequisite:* Vis 310.

Vis 410—Sculpture—3 cr. (0 and 9)
Continuation of Vis 409. *Prerequisite:* Vis 409.

Vis 411—Printmaking—3 cr. (0 and 9)
Advanced studio in Printmaking and related media. *Prerequisite:* Vis 312.

Vis 412—Printmaking—3 cr. (0 and 9)
Continuation of Vis 411. *Prerequisite:* Vis 411.

Vis 413—Photography—3 cr. (0 and 9)
Advanced studio work in photography. *Prerequisite:* Vis 314.

Vis 414—Photography—3 cr. (0 and 9)
Continuation of Vis 413. *Prerequisite:* Vis 413.

Vis 415—Graphics Matrix—3 cr. (0 and 9)
Advanced studio work in visual media. *Prerequisite:* 8 credit hours in Visual Studies courses and permission of instructor.

Vis 416—Graphics Matrix—3 cr. (0 and 9)
Continuation of Vis 415. *Prerequisite:* Vis 415 and permission of instructor.

Vis 417—Advanced Ceramic Arts—3 cr. (0 and 9)
Advanced applied studio work in ceramic sculpture and pottery. *Prerequisite:* Vis 318.

Vis 418—Advanced Ceramic Arts—3 cr. (0 and 9)
Continuation of Vis 417. *Prerequisite:* Vis 417.

Vis 503—20th Century Visual Arts—3 cr. (3 and 0)
A seminar course dealing with Twentieth Century visual art forms in relation to the factors that have influenced the artist and the consequence of his production on society. *Prerequisite:* Vis 305 or 307 or 309 or 311 or 313 or Arch 415 or permission of instructor.

WATER RESOURCES ENGINEERING

Professor: L. G. Rich, *Program Director*

WRE 460—Physical Oceanography—3 cr. (3 and 0)
An integrated treatment of the fluid dynamic, ecologic, geologic, and resource aspects of physical oceanography. The basic principles of the physical aspects of the oceans are presented together with techniques for the application of these fundamentals. Primary emphasis is placed on relating the oceanographic phenomena to relevant problems in the marine environment. *Prerequisite:* Ch 102 and Phys 222, and permission of instructor.

WRE 461—Oceanographical Engineering—3 cr. (3 and 0)
An integrated coverage of various facets of coastal and ocean engineering. Emphasis is placed on introducing the student to selected areas of oceano-

graphical engineering and indicating the basic principles and current applications in these areas. Although the course is engineering oriented, the interaction of the engineer and the marine environment is included where applicable. *Prerequisite:* EM 320.

WRE 660—PHYSICAL OCEANOGRAPHY—3 cr. (3 and 0)

WRE 661—OCEANOGRAPHICAL ENGINEERING—3 cr. (3 and 0)

WRE 811—CLIMATOLOGY—3 cr. (3 and 0)

WRE 812—METEOROLOGY—3 cr. (3 and 0)

WRE 822—WATER MOVEMENT IN SOILS—3 cr. (3 and 0)

WRE 861—HYDROLOGY—3 cr. (3 and 0)

WRE 862—ADVANCED HYDROLOGY—3 cr. (3 and 0)

WRE 864—GROUND-WATER HYDROLOGY—3 cr. (3 and 0)

WRE 865—HYDROLOGY I—3 cr. (3 and 0)

WRE 866—HYDROLOGY II—3 cr. (3 and 0)

WRE 870—STREAM AND ESTAURINE ANALYSIS—3 cr. (3 and 0)

WRE 875—RIVER BASIN PLANNING—2 cr. (2 and 0)

WRE 876—WATER RESOURCES SYSTEMS—2 cr. (2 and 0)

WRE 881—SPECIAL PROBLEMS IN WATER RESOURCES ENGINEERING—1-4 cr. (1-4 and 0)

WRE 883—SELECTED TOPICS IN WATER RESOURCES ENGINEERING—1-3 cr. (1-3 and 0)

WRE 891—RESEARCH—Credit to be arranged.

WRE 981—SPECIAL TOPICS IN WATER RESOURCES—3 cr. (3 and 0)

WRE 982—SPECIAL TOPICS IN WATER RESOURCES—3 cr. (3 and 0)

WRE 991—DOCTORAL RESEARCH—Credit to be arranged.

WILDLIFE BIOLOGY

Associate Professors: S. B. HAYS, R. E. WARE, L. G. WEBB

Assistant Professor: H. A. LOYACANO, JR.

WB 306—WILDLIFE RESOURCES OF THE SOUTHEASTERN UNITED STATES—2 cr. (2 and 0) F, S

A study of the wildlife resources of the Southeastern States, including population trends, life histories and economic importance. Conservation and proper utilization by man is emphasized.

WB 412—WILDLIFE MANAGEMENT—3 cr. (2 and 3) F, S

Basic principles and general practices of wildlife management and conservation will be covered. This course deals with the major problems concerning the management of wildlife resources, with emphasis on upland game species. The laboratory work includes practical work on the Clemson University Woodlands and field trips to several areas where wildlife management is being practiced.

WB 612—Wildlife Management—3 cr. (2 and 3)

WB 809—Wildlife Biology Seminar I—1 cr. (1 and 0)

WB 810—Wildlife Biology Seminar II—1 cr. (1 and 0)

WB 815—Principles of Wildlife Biology—3 cr. (2 and 3)

WB 816—Applied Wildlife Biology—3 cr. (2 and 3)

WB 863—Special Problems—1-6 cr.

WB 891—Research—1-6 cr.

ZOOLOGY

(See also Biology)

Professors: E. W. King, J. K. Reed

Associate Professors: G. W. Anderson, A. S. Tombes, *Chairman;* R. E. Ware

Assistant Professors: W. E. Bachop, E. D. Brodie, S. A. Gauthreaux, Ruth L. Hays, W. K. Willard

Instructor: B. R. Ingram

Zool 100—The Biology of Human Survival—1 cr. (1 and 0)
A biological overview of those aspects of contemporary life which constitute threats to the individual and the social welfare of man now and in the future: rampant reproduction, venereal disease, illegitimacy, sterility, crowding famine, death control, genetic engineering, and hallucinogenic drugs.

Zool 102—Principles of Zoology—2 cr. (2 and 0) F, S, SS
The application of biological principles to animals as exemplified by the structures and functions of invertebrates and vertebrates. Followed by a survey of the animal kingdom. *Prerequisite:* Biol 101.

Zool 104—Laboratory Exercises in Zoology—1 cr. (0 and 2) F, S, SS
Demonstrations and experiments to illustrate the structures and functions of animals considered in Zool 102.

Zool 201—Invertebrate Zoology—4 cr. (3 and 3) F, S
A survey of the phyla of invertebrate animals, including their taxonomy, morphology, development and evolution. *Prerequisite:* Zool 102, 104 or permission of instructor.

Zool 202—Vertebrate Zoology—4 cr. (3 and 3)
A study of vertebrates with an emphasis on systematic relationships and evolutionary advances. Laboratory will be concerned with basic morphological traits of each group as well as the ecology, life history, and identification of local forms. *Prerequisite:* Zool 102, 104.

Zool 301—Comparative Vertebrate Anatomy—3 cr. (2 and 3) F, S, SS
Advanced training in zoological principles, physiology and comparative vertebrate anatomy. *Prerequisite:* Zool 102, 104.

Zool 302—Vertebrate Embryology—3 cr. (2 and 3) F, S, SS
Fundamentals of developmental anatomy of the organ systems as illustrated by the chick and pig. Students prepare histological sections and mounts to acquire practice in laboratory procedures and knowledge of vertebrate micro-

scopic anatomy. Identification of the various tissues is stressed. *Prerequisite:* Zool 102, 104 and 301 or permission of the instructor.

Zool H302—Vetebrate Embryology—3 cr. (2 and 3) F, S, SS
Honors option for Zool 302, admission by special arrangement.

Zool 304—Animal Ecology—3 cr. (2 and 3) F
Marine, fresh water and land animal communities as they exist in South Carolina. Students will gain a knowledge of the common animal associations as they are related to land use through lectures, reading, films and field trips.

Zool H304—Animal Ecology—3 cr. (2 and 3) F
Honors option for Zool 304, admission by special arrangement.

Zool 307—Animal Anatomy and Physiology—3 cr. (2 and 3) F
Anatomy, and physiological processes of ingestion, secretion, excretion, respiration, circulation, reproduction and metabolism of warm-blooded animals. This course is designed for students majoring in Pre-medicine, Pre-veterinary, Animal Science, Dairy Science, and Poultry Science. *Prerequisite:* Zool 102, 104.

Zool 403—Protozoology—3 cr. (2 and 3) S
Taxonomy of the sub-kingdom protozoa with special reference to the parasitic forms directly affecting man. Representative types of free-living forms are surveyed with emphasis on their morphology, physiology and distribution. *Prerequisite:* Zool 102, 104.

Zool H403—Protozoology—3 cr. (2 and 3) S
Honors option for Zool 403, admission by special arrangement.

Zool 404—Animal Pathology—3 cr. (2 and 3) S
Designed to inform students in the causes, treatments, and prevention of animal diseases. Those transmissible to man are considered in detail. Emphasis is placed on hygiene and care of the sick.

Zool 405—Animal Histology—3 cr. (2 and 3) F
Microscopic structures of tissues and organs of the animal body. This course is for students in Pre-veterinary, Pre-medicine and the Animal Science courses. *Prerequisite:* Zool 102, 104.

Zool 408—Physiology and Development of Invertebrates—3 cr. (2 and 3) F
A study of the developmental and functional characteristics of invertebrates.

Zool 410—Limnology—3 cr. (2 and 3) F
This course is designed to familiarize the student with interrelationships between fresh-water organisms and their abiotic environment. *Prerequisite:* Zool 102, 104.

Zool H410—Limnology—3 cr. (2 and 3) F
Honors option for Zool 410, admission by special arrangement.

Zool 411—Animal Ecology—3 cr. (2 and 3)
A fundamental approach to basic ecological principles underlying the interrelationships of organisms with their abiotic environment. A variety of equatic and terrestrial ecosystems will be studied both in the field and in the laboratory.

Zool H411—Animal Ecology—3 cr. (2 and 3)
Honors option for Zool 411, admission by special arrangement.

Zool 456—Parasitology—3 cr. (2 and 3) F

An introduction to the phenomenon of parasitism in the animal kingdom with emphasis on basic principles. Classical and experimental approaches to the study of parasitism are examined in reference to the protozoa, helminths and arthropods.

Zool H456—Parasitology—3 cr. (2 and 3) F

Honors option for Zool 456, admission by special arrangement.

Zool 458—Cell Physiology—3 cr. (2 and 3) F

An introduction to the fundamental processes of physiology as exemplified by the cell. Dynamic cellular environment, organelles, respiration, metabolism, protein synthesis, and basic thermodynamics as it applies to the cell, will be covered. Laboratory will include an introduction to techniques in study of cellular physiology. *Prerequisite:* Zool 102, 104, Organic Chemistry.

Zool H458—Cell Physiology—3 cr. (2 and 3) F

Honors option for Zool 458, admission by special arrangement.

Zool 460—General Physiology—3 cr. (2 and 3) S

Systematic study of the physiology of nervous activity, hormonal control, neuro-hormonal interrelations, circulation, respiration, digestion, renal control, muscular activity and reproduction. Effort in the laboratory will be concentrated toward acquainting the student with methods of obtaining information about these systems. *Prerequisite:* Zool 102, 104 or permission of instructor.

Zool 461—Anatomy—3 cr. (3 and 0) F

Those aspects of anatomy related to the skeletal, circulatory, muscular, nervous, endocrine, respiratory, digestive and excretory systems will be covered. Emphasis will be placed on gross anatomy with some work in micro-anatomy. *Prerequisite:* Zool 102, 104 or permission of instructor.

Zool 462—Herpetology—3 cr. (2 and 3)

Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families and U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology or approval of instructor.

Zool 463—Ichthyology—3 cr. (2 and 3)

Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology or approval of instructor.

Zool 464—Mammalogy—3 cr. (2 and 3)

Systematics, life history, distribution, ecology, and current literature of mammals. Laboratory study of morphology and identification of U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology of approval of instructor.

Zool 465—Ornithology—3 cr. (2 and 3)

The identification, life history and ecology of birds. Field trips, work with bird specimens and correlated reading will give the student a working knowledge of at least 100 species of the common birds.

ZOOL 470—ANIMAL ETHOLOGY—3 cr. (2 and 3)
Classical and current concepts and controversies regarding animal behavior; individual and social behavioral patterns. *Prerequisite:* Vertebrate Zoology or consent of instructor.

ZOOL 475—GENERAL ENDOCRINOLOGY—3 cr. (2 and 3)
This course is an introduction to the basic principles of chemical integration via hormones found throughout the animal kingdom. Morphology and function of various endocrine tissues, hormone chemistry and modes of action will receive major consideration.

ZOOL 602—VERTEBRATE EMBRYOLOGY—3 cr. (2 and 3)

ZOOL 603—PROTOZOOLOGY—3 cr. (2 and 3)

ZOOL 604—ANIMAL PATHOLOGY—3 cr. (2 and 3)

ZOOL 605—ANIMAL HISTOLOGY—3 cr. (2 and 3)

ZOOL 608—PHYSIOLOGY AND DEVELOPMENT OF INVERTEBRATES—3 cr. (2 and 3)

ZOOL 610—LIMNOLOGY—3 cr. (2 and 3)

ZOOL 611—ANIMAL ECOLOGY—3 cr. (2 and 3)

ZOOL 656—PARASITOLOGY—3 cr. (2 and 3)

ZOOL 658—CELL PHYSIOLOGY—3 cr. (2 and 3)

ZOOL 660—GENERAL PHYSIOLOGY—3 cr. (2 and 3)

ZOOL 661—ANATOMY—3 cr. (3 and 0)

ZOOL 662—HERPETOLOGY—3 cr. (2 and 3)

ZOOL 663—ICHTHYOLOGY—3 cr. (2 and 3)

ZOOL 664—MAMMALOGY—3 cr. (2 and 3)

ZOOL 665—ORNITHOLOGY—3 cr. (2 and 3)

ZOOL 670—ANIMAL ETHOLOGY—3 cr. (2 and 3)

ZOOL 675—GENERAL ENDOCRINOLOGY—3 cr. (3 and 0)

ZOOL 801—ANIMAL HISTOLOGY—3 cr. (2 and 3)

ZOOL 802—HISTOLOGICAL TECHNIQUES—3 cr. (1 and 6)

ZOOL 803—POPULATION DYNAMICS—4 cr. (2 and 6)

ZOOL 804—ORNITHOLOGY—3 cr. (2 and 3)

ZOOL 805—ANIMAL PATHOLOGY—3 cr. (2 and 3)

ZOOL 806—COMPARATIVE ANIMAL PHYSIOLOGY—3 cr. (3 and 0)

ZOOL 807—USE OF RADIOISOTOPES IN BIOLOGICAL RESEARCH—3 cr. (2 and 3)

ZOOL 808—RADIOBIOLOGY—3 cr. (2 and 3)

ZOOL 809—TOXICOLOGY—3 cr. (2 and 3)

ZOOL 810—MAMMALOGY—3 cr. (2 and 3)

ZOOL 812—SEMINAR—1 cr. (1 and 0)

ZOOL 813—EVOLUTION—3 cr. (3 and 0)

Zool 830—Histochemistry-Cytochemistry—3 cr. (2 and 3)

Zool 852—Principles and Methods of Systematic Zoology—2 cr. (2 and 0)

Zool 856—Economic Zoology—3 cr. (2 and 3)

Zool 863—Special Problems—1 to 4 cr.

Zool 891—Research—Credit to be arranged.

Zool 991—Research—Credit to be arranged.

PART VI

PUBLIC SERVICE ACTIVITIES

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES STAFF

PUBLIC SERVICE ACTIVITIES

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J. W. Jones, Ph.D. .... *Director of Resident Instruction*
P. K. Gable, Jr., B.S. .... *Administrative Assistant, Agricultural Experiment Station and Resident Instruction*
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G. H. Bonnette, B.S. .... *Administrative Assistant, Extension Service*
M. S. Cely, Jr., M.S. .... *Coordinator, State Extension Management Information System*
D. A. Shelley, B.S. .... *Coordinator, Training, Development and Recruitment*

Extension State Program Leaders

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G. H. Baker, B.S. ..... *State Leader, 4-H and Youth Development Programs*
Ruby M. Craven, Ph.D. .. *State Leader, Extension Home Economics Programs*
B. L. Cunningham, M.S. .... *State Leader, Extension Special Programs*

Extension Supervisors

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G. H. Liebenrood, M.Ed. .... District Agent, Pee Dee District, Clemson
W. H. Funchess, M.S. ..... District Agent, Savannah Valley District, Clemson
Curtys Ballentine, M.S. .. Associate District Agent, Piedmont District, Clemson
Elizabeth B. Berry, B.S. .... Associate District Agent, Savannah Valley District, Clemson
Sarah S. Knox, B.S. ..... Associate District Agent, Pee Dee District, Clemson

Superintendents Branch Experiment Stations

Wayne R. Sitterly, Ph.D.— Truck Station, P. O. Box 3158, St. Andrews Branch, Charleston
D. F. Cohoon, Ph.D. .... P. O. Box C, Edisto Station, Blackville
J. B. Pitner, Ph.D. .... P. O. Box 271, Pee Dee Station, Florence
W. H. Rhodes, B.S. .... Sandhill Station, P. O. Box 1771, Columbia

Agricultural Chemical Services

N. R. Page, Ph.D.*† .... Head of Department, Professor
J. S. Boswell, B.A.† .... Chemist

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* Teaching staff.
† Research staff.

P. A. Bellew, B.S.†	Chemist
Dorothy Brock †	Chemist
V. O. Childers, B.S.†	Chemist
J. T. Gillingham, Ph.D.†	Associate Chemist
B. L. Holst, B.S.†	Chemist
N. J. LeMaster, B.S.†	Chemist
E. E. Leslie, B.S.†	Chemist
W. R. McCaskill, M.S.†	Chemist
Mary Lee McCrackan, A.B.†	Chemist
J. J. Starnes, B.S.†	Chemist

Agricultural Communications

R. C. Hubbard, Jr., M.S.†‡	Head of Department, Editor
L. C. Hamilton, M.S.‡	Extension Information Specialist
W. B. Earle, Jr.‡	Extension Artist
J. E. Kingman, B.A.†‡	Assistant Radio-Televison Editor
J. R. Mattison, B.S.‡	Assistant Radio Editor
Ann Lee A. McPhail, B.A.†‡	Assistant Radio-Television Editor
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Agricultural Economics and Rural Sociology

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A. B. Carroll, Ph.D.*†	Associate Professor
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M. I. Loyd, M.S.†‡	Associate Extension Specialist (Marketing)
J. S. Lytle, Ph.D.*†	Assistant Professor
J. W. McAlhany, M.S.‡	Extension Assistant (Marketing)
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E. L. McLean, Ph.D.†‡	Assistant Professor
L. D. Malphrus, Ph.D.†	Associate Professor
J. F. Miles, Ph.D.†	Associate Professor
W. O. Mizelle, Jr., M.S.†‡	Extension Assistant (Marketing)
J. E. Nix, M.S.†	Agricultural Economist (USDA)
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M. C. Rochester, Ph.D.‡	Extension Specialist
E. W. Siedschlag, A.B.‡	Assistant Extension Specialist (Marketing), Columbia
L. J. Smith, M.S.†‡	Research Assistant (Marketing)
H. C. Spurlock, Ph.D.*†	Associate Professor
J. M. Stepp, Ph.D.*†	Alumni Professor
M. H. Sutherland, M.S.‡	Associate Extension Specialist
J. S. Taylor, B.S.†	Agricultural Statistician, Columbia (USDA)
G. R. von Tungeln, M.S.*†	Associate Professor

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Agricultural Education

L. H. Davis, Ph.D.*	Head of Department, Professor
W. C. Bowen, M.S.*	Associate Professor
E. T. Carpenter, Ed.D.*†	Associate Professor
J. A. Hash, Ed.D.*	Assistant Professor
A. K. Jensen, Ph.D.*	Associate Professor
F. E. Kirkley, M.S.*	Associate Professor

Agricultural Engineering

A. W. Snell, Ph.D.*†‡	Head of Department, Professor
J. C. Alphin, Ph.D.†	Associate Professor, Pee Dee Station
W. A. Balk, B.S.†	Associate Agricultural Engineer, Edisto Station
C. L. Barth, M.S.*	Associate Professor
J. B. Cocke, B.S.†	Agricultural Engineer (USDA)
J. T. Craig, M.S.*	Assistant Professor
D. G. Dickson, M.S.†	Research Assistant
C. W. Doty, M.S.†	Agricultural Engineer, Pee Dee Station (USDA)
T. H. Garner, Ph.D.*†§	Professor
W. E. Garner, M.S.†	Agricultural Engineer (USDA)
W. P. Gladden, B.S.†‡	Assistant Extension Specialist
F. H. Hedden, M.S.‡	Associate Extension Specialist
C. E. Hood, Ph.D.*†	Associate Professor
J. R. Lambert, Ph.D.*†	Associate Professor
J. T. Ligon, Ph.D.*†	Associate Professor
H. P. Lynn, M.S.‡	Associate Extension Specialist
M. C. McKenzie, B.S.‡	Extension Specialist, Principal Specialist
F. C. Patten, B.S.†	Assistant Agricultural Engineer, Pee Dee Station
C. V. Privette, M.S.‡	Assistant Extension Specialist
E. B. Rogers, Jr., M.S.*†	Associate Professor
B. K. Webb, Ph.D.*†	Associate Professor
R. A. Wesley, B.S.†	Agricultural Engineer (USDA)
W. K. Whitehead, M.S.†	Research Assistant
J. M. Williams, M.S.†	Agricultural Engineer (USDA)
T. V. Wilson, M.S.*†	Professor

Agronomy and Soils

U. S. Jones, Ph.D.*†‡	Head of Department, Professor
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C. C. Chen, Ph.D.†	Visiting Professor
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Alfred Manwiller, Ph.D.†	Associate Professor, Pee Dee Station
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B. C. Morton, M.S.†	Agricultural Science Assistant
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C. N. Nolan, Ph.D.‡	Extension Specialist, Principal Specialist
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J. H. Palmer, Ph.D.†‡	Associate Extension Specialist
T. C. Peele, Ph.D.*†	Professor
J. B. Pitner, Ph.D.†	Superintendent and Professor, Pee Dee Station
D. E. Purvis, B.S.†	Assistant, Pee Dee Station
W. H. Rhodes, B.S.†	Superintendent, Sandhill Station
C. E. Rieck, Ph.D.*†	Assistant Professor
R. F. Suman, M.S.†	Associate Professor, Edisto Station
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Animal Science

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W. C. Godley, Ph.D.*†	Professor
D. L. Handlin, M.S.*†	Assistant Professor
J. R. Hill, Jr., Ph.D.*†	Associate Professor
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W. V. Chalupa, Ph.D.*†	Associate Professor
J. F. Dickey, Ph.D.*†	Associate Professor
G. E. Gramling, Ph.D.‡	Associate Extension Specialist
R. W. Henningson, Ph.D.*†	Professor
Victor Hurst, Ph. D.*†	Professor
J. J. Janzen, Ph.D.*†	Professor
J. W. Kelly, M.S.†	Assistant Professor
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C. B. Reeves, M.S.‡	Associate Extension Specialist

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S. G. Turnipseed, Ph.D.†	Associate Professor, Edisto Station
L. G. Webb, Ph.D.*†¶	Associate Professor Leader, Clemson Wildlife Research Project

Experimental Statistics and Statistical Services

W. P. Byrd, Ph.D.*†	Professor
W. E. Johnston, Ph.D.*†	Assistant Professor
J. G. Williams, Jr., B.S.†	Statistical Research Assistant

Farms

John S. Evans, B.S.†	Head of Department

Fertilizer Inspection and Analysis

H. V. Rogers, M.S.	Head of Department

Food Science

W. P. Williams, Ph.D.*†	Head of Department, Professor
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R. F. Borgman, D.V.M., Ph.D.*†	Associate Professor
L. Crook, Ph.D.*†	Assistant Professor
D. M. Henricks, Ph.D.*†	Assistant Professor
J. J. Jen, Ph.D.*†	Assistant Professor
J. H. Mitchell, Jr., Ph.D.*†	Professor

Four-H Club Work

J. B. Williams, B.S.‡	Extension Specialist (4-H Club Work) Principal Specialist
W. C. Clinkscales, B.S.	Assistant Extension Specialist (4-H Club Work)
E. Joyce Richardson, M.S.‡	Assistant Extension Specialist (4-H Club Work)
Georgia T. Roberson, M.Ed.‡	Extension Specialist (4-H Club Work)
J. T. Rogers, B.S.‡	Associate Extension Specialist (4-H Club Work)

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‡ Extension staff.
¶ Part time.

Home Economics

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Rose J. Davis, M.S.‡	Associate Extension Specialist (Nutrition)
Marie S. Hindman, M.S.‡	Extension Specialist (Nutrition)
Ursula A. Holahan, M.S.	Extension Specialist (Clothing)
Frances H. Odom, M.A.‡	Extension Specialist (Housing)
Julia B. Taylor, M.S.‡	Extension Specialist (Home Furnishings)

Horticulture

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R. A. Baumgardner, Ph.D.†‡	Associate Extension Specialist
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J. H. Crawford, M.S.†	Assistant Horticulturist
D. O. Ezell, Ph.D.†‡	Assistant Extension Specialist
R. J. Ferree, M.S.‡	Extension Specialist, Principal Specialist
J. P. Fulmer, M.S.*†	Assistant Professor
C. E. Gambrell, Jr., M.S.†	Assistant Horticulturist, Sandhill Station
M. G. Hamilton, Ph.D.†	Associate Professor, Edisto Station
M. B. Hughes, Ph.D.†	Professor, Edisto Station
C. R. Johnson, Ph.D.*†	Assistant Professor
E. V. Jones, M.S.‡	Assistant Extension Specialist
W. S. Jordan, Ph.D.*	Assistant Professor
F. B. Ledeboer, Ph.D.*†	Assistant Professor
J. A. Martin, B.S.†	Associate Professor
W. L. Ogle, Ph.D.*†	Professor
H. J. Sefick, M.S.*†	Associate Professor
E. T. Sims, Jr., Ph.D.*†	Associate Professor
B. J. Skelton, Ph.D.*†	Associate Professor
G. E. Stembridge, Ph.D.*†	Associate Professor
F. W. Thode, M.S.*	Associate Professor
L. O. Van Blaricom, M.S., Ch.E.*†	Professor

Plant Pathology and Physiology

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O. W. Barnett, Ph.D.*†	Assistant Professor
L. W. Baxter, Ph.D.*†	Professor
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D. F. Cohoon, Ph.D.†	Superintendent and Professor, Edisto Station
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Wesley Witcher, Ph.D.*†	Professor
E. I. Zehr, Ph.D.*†	Assistant Professor

Plant Pest Regulatory Service

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W. M. Epps, Ph.D.*†	State Plant Pathologist
R. C. Fox, Ph.D.*†	Professor

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F. J. Howard, Jr., M.S.†	District Entomologist
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J. E. McDonald, B.S.†	Entomology Assistant
L. R. Morgan, B.S.†	Entomology Assistant
D. C. Weeks, M.S.†	District Supervisor
Wesley Witcher, Ph.D.*†	Associate Professor

Poultry Science

B. D. Barnett, Ph.D.*†‡	Head of Department, Professor
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M. A. Boone, Ph.D.†	Professor
J. B. Cooper, M.S.*†	Associate Professor
J. E. Jones, Ph.D.*†	Assistant Professor
C. F. Risher, B.S.‡	Associate Extension Specialist, York
J. Solis, Ph.D.*†	Assistant Professor
T. C. Stewart, Sr., B.S.‡	Associate Extension Specialist
D. E. Turk, Ph.D.*†	Associate Professor
W. S. Walker, M.Ed.‡	Associate Extension Specialist, Columbia
J. F. Welter, M.S.‡	Assistant Extension Specialist

Seed Certification

R. H. Garrison, B.S.†	Head of Department, Associate Plant Breeder
J. O. Black, Jr., M.S.†	Seed Certification Specialist
R. A. Jameson, M.S.†	Seed Certification Specialist

COLLEGE OF FOREST AND RECREATION RESOURCES STAFF

Wm. H. Davis McGregor, Ph.D.	Dean
Herbert Brantley, Ph.D.	Associate Dean

Forestry

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M. H. Bruner, M.F.*†	Associate Professor
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K. Lehotsky, Ph.D.*†‡	Professor
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W. A. Shain, Ph.D.*†	Associate Professor
A. T. Shearin, M.S.†	Baruch Resident Research Forest Manager
J. R. Warner, D.F.*†	Professor
T. E. Wooten, Ph.D.*†	Assistant Professor

---

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† Research staff.
‡ Extension staff.

COUNTY AGENTS

County	*Name*	*Post Office*
Abbeville	L. H. Bull, B.S.	Abbeville
Aiken	J. H. Evans, B.S.	Aiken
Allendale	Johnnie Brewer, B.S.	Allendale
Anderson	H. D. Marett, B.S.	Anderson
Bamberg	E. D. Dean, M.S.	Bamberg
Barnwell	J. B. Griffith, B.S.	Barnwell
Beaufort	Cleveland Sanders, B.S.	Beaufort
Berkeley	J. E. Yonce, B.S.	Moncks Corner
Calhoun	R. N. Chastain, B.S.	St. Matthews
Charleston	B. S. Lawrimore, B.S.	Charleston
Cherokee	W. A. Ridgeway, B.S.	Gaffney
Chester	D. C. Wylie, Jr., B.S.	Chester
Chesterfield	J. C. Willis, B.S.	Chesterfield
Clarendon	R. D. McNair, B.S.	Manning
Colleton	J. R. White, B.S.	Walterboro
Darlington	W. J. Gray, B.S.	Darlington
Dillon	R. C. DuBose, B.S.	Dillon
Dorchester	D. E. Epps, B.S.	St. George
Edgefield	J. W. Gilliam, Jr., B.S.	Edgefield
Fairfield	M. H. Lynn, B.S.	Winnsboro
Florence	H. F. Livingston, Jr., B.S.	Florence
Georgetown	H. B. Hardee, B.S.	Georgetown
Greenville	J. K. Jones, B.S.	Greenville
Greenwood	T. J. Bryson, B.S.	Greenwood
Hampton	E. C. Wallace, M.S.	Hampton
Horry	W. D. Witherspoon, B.S.	Conway
Jasper	E. G. Tate, Jr., B.S.	Ridgeland
Kershaw	R. R. Montgomery, B.S.	Camden
Lancaster	D. R. Gowan, Jr., M.S.	Lancaster
Laurens	Marett Outz, B.S.	Laurens
Lee	V. F. Linder, B.S.	Bishopville
Lexington	M. A. Bouknight, B.S.	Lexington
McCormick	J. R. Meredith, M.S.	McCormick
Marion	M. J. Carter, B.S.	Marion
Marlboro	R. C. Smith, B.S.	Bennettsville
Newberry	A. F. Busby, B.S.	Newberry
Oconee	J. C. Morgan, B.S.	Walhalla
Orangeburg	D. W. Howe, B.S.	Orangeburg
Pickens	J. R. Wood, B.S.	Pickens
Richland	R. W. Bailey, B.S.	Columbia
Saluda	W. H. Craven, Jr., B.S.	Saluda
Spartanburg	W. J. Martin, B.S.	Spartanburg
Sumter	T. B. Tillman, B.S.	Sumter
Union	J. L. Cochran, B.S.	Union
Williamsburg	L. B. Harrington, B.S.	Kingstree
York	C. H. Fant, B.S.	York
Area Agent—Livestock	J. E. Barker, M.S.	Anderson
Area Agent—Com. and Res. Development	A. L. Padgett	Charleston
Area Agent—Ornamentals	C. W. Thompson, M.S.	Charleston
Area Agent—Livestock	H. L. Eason, B.S.	Chester
Area Agent—Poultry	J. F. Welter, M.S.	Greenville
Area Agent—Horticulture	J. D. Ridley	Spartanburg
Area Agent—Livestock	B. W. Sherer, B.S.	Spartanburg

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Aiken	W. A. Beasley, Assoc., M.S.	Aiken
Aiken	T. A. Hammond, Assoc., B.S.	Aiken
Allendale	J. E. Cely, B.S.	Allendale
Anderson	N. C. Anderson, Assoc., B.S.	Anderson
Anderson	G. W. Stewart, Assoc., B.S.	Anderson
Anderson	W. R. Roberts, B.S.	Anderson
Bamberg	E. D. Dean, Assoc., M.S.	Bamberg
Bamberg	J. M. Thomas, B.S.	Bamberg
Barnwell	B. R. Stepp, B.S.§	Barnwell
Beaufort	P. T. Seabrook, Assoc., M.S.	Beaufort
Beaufort	J. A. Baker, B.S.	Beaufort
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Charleston	J L. Gowdy, B.S.	Charleston
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Cherokee	H. B. Pasley, B.S.	Gaffney
Cherokee	W. J. Hendrix, B.S.	Gaffney
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Chesterfield	J. N. Sweeney, B.S.	Chesterfield
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Florence	J. M. Parnell, Assoc., B.S.	Florence
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Florence	T. R. Henderson, B.S.	Florence
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Greenville	F. D. Garrett, Assoc., B.S.	Greenville
Greenville	H. G. Oates, Assoc., B.S.	Greenville
Greenville	Ronald O'Neal, B.S.	Greenville
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Greenwood	J. A. Livingston, B.S.	Greenwood
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Hampton	J. C. Pardue, Jr., B.S.	Hampton
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Laurens	A. F. Williams, Assoc., M.S.	Laurens
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Lee	John Mott, B.S.	Bishopville
Lexington	R. L. Boozer, Assoc., M.Ed.	Lexington
Lexington	W. C. Jones, Jr., Assoc., B.S.	Lexington
Marion	C. A. Brown, Assoc., B.S.	Marion
Newberry	J. O. Donkle, Assoc., B.S.	Newberry

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Newberry	J. R. Queener, B.S.	Newberry
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Orangeburg	J. L. Hayden, Assoc., B.S.	Orangeburg
Orangeburg	Reuel McLeod, Assoc., B.S.	Orangeburg
Orangeburg	Q. J. Smith, Assoc., M.S.	Orangeburg
Orangeburg	Leon Carson, B.S.	Orangeburg
Pickens	F. M. Fleming, Assoc., B.S.	Pickens
Richland	O. F. Huff, Assoc., B.S.	Columbia
Richland	Charlie Bronson, Jr., Assoc., M.S.	Columbia
Saluda	J. W. Riser, Assoc., B.S.	Saluda
Spartanburg	G. W. Bowen, Jr., Assoc., B.S.	Spartanburg
Spartanburg	Crayton McCown, Assoc., B.S.	Spartanburg
Spartanburg	R. N. Smith, Assoc., B.S.	Spartanburg
Sumter	N. F. Brown, B.S.	Sumter
Sumter	W. P. Yates, Assoc., B.S.	Sumter
Union	W. J. Ruff, Assoc., B.S.	Union
Williamsburg	R. M. Johnston, Assoc., B.S.	Kingstree
Williamsburg	J. F. Fitts, B.S.	Kingstree
York	J. G. Bowman, Assoc., B.S.	York
York	J. D. Williams, Assoc., B.S.	York
York	J. W. Pridmore, B.S.	York

EXTENSION HOME ECONOMISTS

County	*Name*	*Post Office*
Abbeville	Sara M. Glenn, B.S.	Abbeville
Aiken	Alpha C. Jenkins, B.S.	Aiken
Allendale	Barbara O. Lewis, A.B.	Allendale
Anderson	Mary M. Thompson, M.S.	Anderson
Bamberg	Rachel E. Anderson, B.S.	Bamberg
Barnwell	Evelyn S. Williams, B.S.	Barnwell
Beaufort	Vivian C. Gibson, B.S.	Beaufort
Berkeley	Matilda B. von Lehe, B.S.	Moncks Corner
Calhoun	Joann R. Zeigler, B.S.	St. Matthews
Charleston	Lillian R. Goldberg, B.S.	Charleston
Cherokee	Lucille B. Alsing, B.S.	Gaffney
Chester	Judith C. Gaskins, B.S.	Chester
Chesterfield	Lillian D. Rivers, B.S.	Chesterfield
Clarendon	Miriam F. Rigby, B.S.	Manning
Colleton	Emily B. Warren, B.S.	Walterboro
Darlington	Sara E. Roper, B.S.	Darlington
Dillon	Claire Baker, B.S.	Dillon
Dorchester	Bernice H. Brown, B.S.	St. George
Edgefield	Dorothy O. Herlong, B.S.	Edgefield
Fairfield	Theresa Beckham, B.S.	Winnsboro
Florence	Eleanor M. Foster, B.S.	Florence
Georgetown	Alice N. Milligan, B.S.	Georgetown
Greenville	Mary M. Stone, M.S.	Greenville
Greenwood	A. Louise McColl, B.S.	Greenwood
Hampton	Rebecca G. Platts, B.S.	Hampton
Horry	R. Violet Navy, B.S.	Conway
Kershaw	Mary S. Day, B.S.	Camden
Lancaster	Carolyn P. Tolson, B.S.	Lancaster
Laurens	Helen C. Camp, B.S.	Laurens
Lee	Sallie M. Moore, B.S.	Bishopville
Lexington	Margaret G. McFadden, B.S.	Lexington
McCormick	Clara R. Hanvey, B.S.	McCormick
Marion	Carolyn Meares, B.S.	Marion

County	*Name*	*Post Office*
Marlboro	Louise Heriot, M.Ed.	Bennettsville
Newberry	Mildred K. Holliday, B.S.	Newberry
Orangeburg	Huldah P. McKnight, B.S.	Orangeburg
Pickens	Mary P. Batson, B.S.	Pickens
Richland	Eleanor W. Jones, B.S.	Columbia
Saluda	Catherine S. Boozer, B.S.	Saluda
Spartanburg	Linda C. Durham, B.S.	Spartanburg
Sumter	Evangeline T. Thompson, B.S.	Sumter
Union	Willa H. Jones, B.S.	Union
Williamsburg	Eva Lawrence, B.S.	Kingstree
York	Jennie M. Riddle, B.S.	York

ASSOCIATE AND ASSISTANT EXTENSION HOME ECONOMISTS

County	*Name*	*Post Office*
Aiken	Lonieal H. Jackson, Assoc., B.S.	Aiken
Aiken	Kathy L. Arthur, B.S.	Aiken
Allendale	Edna K. DuPree, Assoc., B.S.	Allendale
Anderson	Myra J. Miller, B.S.	Anderson
Anderson	Mary A. Hall, B.S.	Anderson
Anderson	Cynthia W. Williford, Assoc., M.S.	Anderson
Bamberg	Lillie J. Limehouse, Assoc., B.S.	Bamberg
Barnwell	Valleria A. Sessions, B.S.	Barnwell
Beaufort	Lillie B. Crosby, Asst., B.S.	Beaufort
Beaufort	Louise Williams, B.S.	Beaufort
Berkeley	Doris T. Dauphiney, B.S.	Moncks Corner
Charleston	June E. Plaxico, B.S.	Charleston
Charleston	Rachel R. Crawford, B.S.	Charleston
Charleston	Emma J. Cooper, B.S.	Charleston
Cherokee	Leota S. Littlejohn, B.S.	Gaffney
Chesterfield	Judy A. Anderson, B.S.	Chesterfield
Clarendon	Claudette L. Greene, B.S.	Manning
Colleton	Annette R. Gilmore, B.S.	Walterboro
Colleton	Wanda F. Horton, B.S.	Walterboro
Darlington	Joyce D. Byrd, B.S.	Darlington
Dillon	Barbara S. Berry, B.S.	Dillon
Dorchester	Jacqueline S. Briles, A.B.	St. George
Edgefield	Mary H. Ouzts, B.S.	Edgefield
Fairfield	Mae E. Wells, B.S.	Winnsboro
Florence	Grace L. Taylor, B.S.	Florence
Florence	Hattie P. Lowery, Assoc., M.S.	Florence
Florence	Sandra M. Scarboro, B.S.	Florence
Florence	Pontheola Edwards, B.S.	Florence
Georgetown	Dorthula B. Bonds, B.S.	Georgetown
Greenville	Harriet E. Holton, B.S.	Greenville
Greenville	Alma A. Devore, B.S.	Greenville
Greenville	Elaine C. Barnes, B.S.	Greenville
Greenwood	Janie Lancaster, B.S.	Greenwood
Greenwood	Madge W. Hardy, Assoc., B.S.	Greenwood
Horry	Diane N. Hess, B.S.	Conway
Horry	Marian M. Watson, Assoc., M.Ed.	Conway
Jasper	Frances M. Petrie, B.S.	Ridgeland
Kershaw	Dean H. Lucas, Assoc., B.S.	Camden
Lancaster	Jessie J. Shannon, B.S.	Lancaster
Laurens	Nellie K. Harrison, B.S.	Laurens
Lee	Vivian Searles, B.S.	Bishopville
Lexington	Jeralyn K. Fallaw, B.S.	Lexington
Lexington	Betty E. Baird, B.S.	Lexington

County	*Name*	*Post Office*
Marion	Shirley M. Patterson, Assoc., B.S.	Marion
Marion	Susan M. Tomlinson, B.S.	Marion
Newberry	Jeanne J. Fortson, B.S.	Newberry
Newberry	Lillian G. Saunders, Assoc., B.S.	Newberry
Oconee	Mary C. Martin, B.S.	Walhalla
Orangeburg	Wilma D. McCoy, B.S.	Orangeburg
Orangeburg	Margaret A. Culler, B.S.	Orangeburg
Orangeburg	Laura G. Carlson, B.S.	Orangeburg
Pickens	Sarah E. Richardson, B.S.	Pickens
Richland	Rhodan P. McCollom, B.S.	Columbia
Richland	Margaret F. Mattox, B.S.	Columbia
Richland	Doris B. Fearrington, Assoc., B.S.	Columbia
Saluda	Myrtice T. Boazman, Assoc., B.S.	Saluda
Spartanburg	Delphine O. Thornton, B.S.	Spartanburg
Spartanburg	Nancy H. Williams, Assoc., B.S.	Spartanburg
Spartanburg	Sandra J. Carroll, B.S.	Spartanburg
Sumter	Laura A. Webster, B.S.	Sumter
Sumter	Jacqueline M. McKnight, B.S.	Sumter
Union	Marie P. Wolfe, B.S.	Union
Williamsburg	Polly M. Connor, B.S.	Kingstree
York	Johnnie G. Sloan, Assoc., B.S.	York
York	Andrea T. Davis, B.S.	York
York	Vashtie B. Hamid, B.S.	York

EXTENSION SERVICE EMERITI

Lora Warner Alford, B.S.	*County Agent Emeritus*
John Chipley Anthony, B.A.	*County Agent Emeritus*
Delphena Wilkerson Arnold, L.I.	*Assoc. Home Demonstration Agent Emeritus*
Roscoe Clifton Bacote, B.S.A., M.Ag.Ed.	*Associate County Agent Emeritus*
Ophelia Sue Barker, B.S.	*Home Demonstration Agent Emeritus*
Benjamin Barnwell	*Associate County Agent Emeritus*
George Washington Bonnette, B.S.	*County Agent Emeritus*
Thomas Otis Bowen, B.S.	*County Agent Emeritus*
Hugh Asbury Bowers, M.S.	*Extension Horticulturist—Truck Crops Emeritus*
Elizabeth DuBose Boykin, A.B.	*Home Demonstration Agent Emeritus*
Harry Gilmore Boylston, B.S.	*Extension Cotton Improvement Specialist Emeritus*
Lillian Watts Brown, L.I.	*Associate Home Demonstration Agent Emeritus*
George Dewey Butler	*Assistant County Agent Emeritus*
Odil Williams Cain, B.S.	*County Agent Emeritus*
Charles Babb Cannon, B.S.	*County Agent Emeritus*
Claude William Carraway, B.S.	*County Agent Emeritus*
Eleanor DeVeaux Carson, A.B., M.S.	*Home Demonstration Agent Emeritus*
Cammie Fludd Clagett, B.S.	*Associate Home Economist Emeritus*
Mattie Lee Cooley, B.S.	*Home Demonstration Agent Emeritus*
Carl Golden Cushman, B.S.	*Leader Emeritus, Dairy Extension Work*
George Washington Daniels, L.I.	*Associate County Agent Emeritus*
George Washington Dean, M.S.	*Area Agent—Livestock Emeritus*
Spencer Cholier Disher, L.I.	*Associate County Agent Emeritus*
Augustus Lowry DuRant, B.S., M.S.	*Leader, Livestock Work Emeritus*
James Malcolm Eleazer, B.S.	*Extension Information Specialist Emeritus*
Silas Wightman Epps, B.S.	*County Agent Emeritus*
Samuel Ernest Evans, B.S., M.S.	*County Agent Emeritus*
Paul Bryson Ezell, B.S.	*County Agent Emeritus*
Margaret Barron Fewell, B.A.	*Home Demonstration Agent Emeritus*
Eugene Frederick, B.S.	*Associate County Agent Emeritus*
Rosa Gibbs Gadson, L.I.	*Associate Home Demonstration Agent Emeritus*
Paul Matthew Garvin, B.S.	*County Agent Emeritus*
Percy Harold Gooding, B.S., M.S.	*Leader, Poultry Extension Work Emeritus*

Cecil Pound Goodyear, B.S.	*Associate County Agent Emeritus*
Gussie McCottry Goudlock, B.S.	*Assoc. Extension Home Economist Emeritus*
Clifton Wass Hall, B.S.	*Associate Extension Specialist—Forestry Emeritus*
Mary Catherine Haynie, B.A.	*Home Demonstration Agent Emeritus*
Isobel Patterson Heaton, B.S.	*Extension Home Economist Emeritus*
Elizabeth Herbert, B.A.	*Home Demonstration Agent Emeritus*
Ellie Lanham Herrick, B.S.	*Family Life Specialist Emeritus*
Jesse Howard Hopkins, Sr., B.S.	*County Agent Emeritus*
Julia Stebbins Howerton	*Home Demonstration Agent Emeritus*
Ralph Alexander Jackson, B.S.	*County Agent Emeritus*
Harriett Frazier Johnson, A.B., B.S., M.A.	*State Girls' Club Agent Emeritus*
Laura Connor Johnson, B.S.	*Extension Home Economist Emeritus*
Wayman Johnson, B.S., M.S.	*Associate Extension Specialist —4-H Club Emeritus*
Vernon Morris Johnston, B.S.	*County Agent Emeritus*
Jane Ketchen, B.A.	*Assistant State Home Demonstration Agent Emeritus*
James LeGrand King, B.S.	*County Agent Emeritus*
Lonny Inge Landrum, B.S.	*State Home Demonstration Agent Emeritus*
Jamie Tarlton Lazar, B.S.	*District Agent Emeritus*
Thomas Brougham Lee, B.S.	*County Agent Emeritus*
Robert Howe Lemmon, B.S.	*County Agent Emeritus*
Jessie Monroe Lewis, B.S.	*District Agent Emeritus*
Clarence Harmon Lomas, B.S.,	*Assoc. Extension Specialist—Dairy Sc. Emeritus*
Janie Letitia McDill, A.B., B.S., M.S.	*Nutritionist Emeritus*
Henry Abner McGee	*Extension Tobacco Specialist Emeritus*
Elizabeth McNab, A.B.	*Home Demonstration Agent Emeritus*
John Doby Marshall, B.S.	*Associate County Agent Emeritus*
Margaret Martin, B.A., M.A.	*Extension Food Production and Conservation Specialist Emeritus*
Marion Causey Mason, B.S.	*County Agent Emeritus*
Booker Talifero Miller, B.S.	*Associate County Agent Emeritus*
John Dalton Miller, B.S.	*County Agent Emeritus*
Izora Miley	*Home Demonstration Agent Emeritus*
T. W. Morgan, M.S.	*Associate Director of Extension Emeritus*
Sallie Pearce Musser, B.A., M.A.	*State Home Demonstration Agent Emeritus*
Juanita Henderson Neely, A.B., M.S.,	*State Home Demonstration Agt. Emeritus*
Margaret Myrtle Nesbitt, B.S.	*Extension Home Economist Emeritus*
George Bass Nutt, B.S., M.S.	*Director of Extension Emeritus*
Rosa Reed Odom, B.S.	*Associate Extension Home Economist Emeritus*
Marian Baxter Paul, B.S.	*Assistant in Home Economics Extension Emeritus*
Houston Stafford Person, B.S.	*Associate County Agent Emeritus*
Theodosia Dargan Plowden	*District Agent Emeritus*
Gertrude Hall Sanders, B.S.	*Associate Home Economist Emeritus*
Portia Seabrook, A.B., M.S.	*Extension Clothing Specialist Emeritus*
Etta Sue Sellers, B.A.	*Home Demonstration Agent Emeritus*
Moses Marcus Sitton, B.S., M.S.	*Associate County Agent Emeritus*
Mahala Jane Smith, B.S.	*Home Demonstration Agent Emeritus*
Sallie McKinnon Smith, B.S.	*Extension Home Economist Emeritus*
Vela Mariah Smith, B.S., M.S.	*Extension Home Economics Specialist —Clothing Emeritus*
Richard Dudley Steer, B.S.	*Assoc. Extension Specialist—Marketing Emeritus*
Stiles Conger Stribling, B.S.	*Agricultural Editor Emeritus*
Lena Elizabeth Sturgis	*Home Demonstration Agent Emeritus*
Marguerite Spearman Summer, B.S.	*Home Demonstration Agent Emeritus*
Van Buren Thomas, B.S.A.	*Assistant County Agent Emeritus*
Carrie Carson Tomlinson, B.S., M.A.	*Home Demonstration Agent Emeritus*
Ernest Craig Turner, B.S.	*Extension Conservation Specialist Emeritus*
Larkin Vandiville Walker, B.S.	*Associate County Agent Emeritus*
Audley Hoffman Ward, B.S., M.S.	*District Agent Emeritus*
Mabel Price Washington, B.S.,	*Associate Home Demonstration Agent Emeritus*
David Wayne Watkins, B.S., M.A.	*Director Emeritus*
Ernest Nesbit Williams, B.S.	*Assistant in Agricultural Extension Emeritus*

LIVESTOCK-POULTRY HEALTH DEPARTMENT

P. O. Box 1771
COLUMBIA, SOUTH CAROLINA 29202

Director and State Veterinarian

Carl E. Boyd, D.V.M.	Columbia

State Associate Director

John B. Thomas, D.V.M.	Columbia

Federal Assistant Director

John A. Kimsey, D.V.M.	Columbia

Meat Inspection Program

George D. Batcheldor, Sr., D.V.M., *Chief*	Columbia
Lloyd V. Fry, D.V.M., *Assistant Chief*	Columbia
A. F. Allison, D.V.M.	Greenville
Thomas F. Hodges, D.V.M.	Orangeburg
Howard B. Slider, V.M.D.	Columbia
Gus A. Vaninetti, D.V.M.	Florence
Glenn A. Washburn, D.V.M.	Batesburg

Livestock Laboratory

Bert W. Bierer, V.M.D., *Director*	Columbia
H. Gaffney Blalock, D.V.M., Ph.D.	Columbia
Walter T. Carll, D.V.M.	Columbia
Julian Cornwell, D.V.M.	Columbia
W. T. Derieux, D.V.M.	Columbia
T. H. Eleazer, D.V.M.	Columbia
W. H. Rhodes, D.V.M.	Columbia

Field Veterinary Supervisors

O. E. Baker, D.V.M.	Columbia
D. E. Goodman, D.V.M.	Turbeville
S. L. Moore, D.V.M.	Clemson

State Livestock Law Enforcement Officers

James C. Epps, Jr., B.Sc.	Columbia
Charles L. Fleming, B.Sc.	Columbia
Charles E. Grant, B.Sc.	Columbia

Federal Veterinary Medical Officers

John N. Dalton, D.V.M.	Bamberg
M. L. Gunnels, D.V.M.	Walterboro
J. B. Hendricks, D.V.M.	Columbia
Malcolm C. Johnson, D.V.M.	Camden
H. A. Jordon, D.V.M.	Timmonsville
J. M. Love, D.V.M.	Chester
Herbert Racoff, D.V.M.	Columbia
Thomas J. Wheelin, D.V.M.	North Augusta
Keith N. Wiser, D.V.M.	Greer

THE SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION

The South Carolina Agricultural Experiment Station is the research branch of the College of Agriculture and Biological Sciences. The nucleus of its research planning and efforts are performed by scientists in 16 departments and two special units located on the campus at Clemson. Each department conducts specific research projects in its own field. The findings from these projects are made known to the public through special publication and news releases. Five branch experiment stations, each located in a different area of the state, operate as separate units under the direction and organization of the Clemson station.

The goal of the station is to provide, through research, needed materials, techniques, and information which can result in more effective agricultural production and marketing. The farmer's work can be made easier, cheaper, and more profitable by applying the information obtained through research designed to learn what effect current farm practices have on the financial return he gets. Newer agricultural methods, not yet put into use by farmers, are also studied with the appropriate release of findings.

The opportunity is available, to a limited number of undergraduate students in most of the departments, to work and gain experience in research methods and procedures. Many of the departments also offer Graduate Research Assistantships to students interested in working on a research program while pursuing a graduate degree program in the corresponding discipline.

Laboratories of the station are open for inspection by students, farmers, and the public in general. Information may be requested on any specific problem encountered in Agriculture by writing to the station Director. A full report of the work and expenditures of the South Carolina Agricultural Experiment Station is published annually. This and other publications of the station will be sent, upon request, free of charge.

REGULATORY AND PUBLIC SERVICE PROGRAMS

The Division of Regulatory and Public Service Programs functions as one of the five divisions in the College of Agriculture and Biological Sciences and includes the Departments of Fertilizer Inspection and Analysis, Seed Certification and Foundation Seed, and Plant Pest Regulatory Service.

Fertilizer Inspection and Analysis

The Fertilizer Inspection and Analysis Department is organized under the Regulatory and Public Service Programs Division of the

College of Agriculture and Biological Sciences. The inspecting and analyzing of fertilizer began as early as 1893. Responsibilities of the Department include procuring official samples and analyzing them to see that the guaranteed analysis has been met and inspecting for proper bag printing and weights of fertilizer. Before any fertilizer is offered for sale in South Carolina, it must be registered with the Fertilizer Inspection and Analysis Department. The department head, two inspectors, and six part-time inspectors, who are also deputized as economic poison inspectors, visit all fertilizer and pesticide manufacturing plants. Samples are procured at plants, farms and dealers' warehouses and, as far as possible, in proportion to the sales of individual companies. Functions of the department not only afford consumer protection, but also assist the fertilizer industry in quality control.

Some 6,000 fertilizer samples and 1,800 to 2,000 economic poison samples are procured annually. Normally, the percentage of samples deficient in analysis for fertilizers is in the 8 to 12 percent range, with refunds amounting to some $79,000. The penalty refund is made to the ultimate user. In the case of a deficiency in nitrogen, the penalty is three times the actual value of the shortage, while for phosphoric acid and potash it is four times the value of the shortage.

The Annual Bulletin contains the following principal items: Fertilizer usage data; the average analytical findings by brand and grades of those samples meeting the guarantee and those not meeting the guarantees. The names, addresses and telephone numbers of all inspectors are also listed.

Fertilizer usage data are very useful to fertilizer manufacturers and government agencies in evaluating sales and educational programs as well as establishing trends on which to base future fertilizer manufacture.

The Agricultural Chemical Services Department performs the analytical work for both fertilizers and economic poisons.

Foundation Seed and Seed Certification

The South Carolina Foundation Seed Association is charged with the responsibility of increasing breeder seed of adapted Experiment Station and USDA varieties to foundation and registered seed in order that seedsmen and farmers might obtain these varieties at the earliest possible time. There are 18 crops and 51 varieties in the Foundation Seed Program.

The South Carolina Crop Improvement Association inspects and certifies for farmers where foundation and registered seed is planted in order that certified seed can be produced.

The South Carolina State Crop Pest Commission (Plant Pest Regulatory Service)

The State Crop Pest Act was passed by the legislature in 1912 and designated five members of the Board of Trustees of Clemson University to compose the South Carolina State Crop Pest Commission.

The purpose of the act is to prevent, as far as possible, the introduction into South Carolina of injurious plant pests and to limit the spread of those already within the state. The Commission is also charged with the enforcement of the South Carolina Economic Poisons Law, the Bee Disease Act, and the Abandoned Orchard Act.

The work is performed by the promulgation and enforcements of certain rules, regulations and quarantines which, in the judgement of the Commission, are necessary to protect the agricultural interests of South Carolina.

The State Entomologist, the State Plant Pathologist, and their agents are responsible for the enforcement of the regulations and have been designated by the Commission as the Plant Pest Regulatory Service.

THE CLEMSON UNIVERSITY EXTENSION SERVICE

The Clemson University Extension Service is a branch of Clemson University and is a cooperative service supported by the counties, the State, and the Federal government. The Extension Service is responsible for conducting, with all people of South Carolina, the cooperative educational and demonstration programs in agriculture and home economics of Clemson University and the United States Department of Agriculture.

The function of the Extension Service is to make available to farmers, homemakers, and rural boys and girls, through on-the-farm service, demonstrations, meetings, newspaper articles, publications, radio and television broadcasts, and other suitable methods, the results of research and successful farm and home experiences. The Service also assists, through interpretation, practical demonstrations and otherwise, in applying and using this information to improve farms, farm homes, and communities, to the end that a safe, sound, and progressive rural life and agriculture may be built.

The annual plan of agricultural and home economics extension work is developed and carried out with close cooperation between the Extension Service and the farm and home leadership of the State, the counties, and the rural communities and neighborhoods.

The Staff of Cooperative Extension Workers includes the director, associate director, an administrative assistant, a coordinator for training, development and recruitment, a coordinator for the Extension Management Information System, 5 state program leaders, an assistant to the state home economics leader, 3 district supervisory agents, 3 associate district supervisory agents, 46 county agents, 46 county home economists, 56 associate county agents, 18 associate home economists, 52 assistant county agents, 52 assistant home economists, 10 area agents, and 78 specialists in agricultural economics, home economics, agricultural engineering, agronomy, 4-H club work, dairying, crop insects and diseases, cotton ginning, forestry, horticulture, animal science, marketing, poultry and turkeys, publications, community and resource development, soil conservation, visual instruction, and television.

LIVESTOCK-POULTRY HEALTH DEPARTMENT

The Clemson University Livestock-Poultry Health Department is consolidated under one Director with the United States Department of Agriculture, Agricultural Research Service, Animal Disease Eradication Division, and is known as the State-Federal Livestock Disease Eradication Program. This department is charged with the control and eradication of contagious, infectious and communicable diseases of livestock and poultry, and with the inspection of meat and meat by-products at slaughtering and processing plants under state inspection. When requested, investigations are made, consultations are held and assistance in diagnosis is rendered. This department further organizes, develops, and carries on education programs for the control and eradication of diseases. Quarantine measures are employed to prevent, as far as possible, the introduction or spread of livestock diseases into this state.

The Clemson Livestock Laboratory, a fully equipped modern laboratory staffed with highly trained personnel, is maintained 14 miles northeast of Columbia on U. S. Highway No. 1, at the site of the Sandhill Experiment Station. This laboratory is prepared to assist veterinarians and owners of livestock and poultry in making postmortem laboratory examinations and bacteriological and pathological studies to aid in the diagnosis of diseases. If necessary, sufficient equipment can be sent into the field to diagnose and control disease on the spot.

The administrative office is located in the Livestock Laboratory. Adequate records and identification of livestock are kept. A staff of veterinarians works from the Columbia office, and field veterinarians are located in various sections of the State. In addition to the regular field force of veterinarians directly connected with the Columbia office, practicing veterinarians are commissioned as State-Federal Accredited Veterinarians and assist in the eradication of infectious diseases of livestock. At present there are 146 veterinarians so commissioned and their locations are such that the Clemson University Livestock-Poultry Health Department is in a position to control and eradicate disease promptly and completely in all sections of the State.

This department is required by legislative enactment and supported by legislative appropriation.

THE OFFICE OF ENGINEERING RESEARCH

The Office of Engineering Research of Clemson University was established in the College of Engineering in July 1962. Its purpose is to coordinate and stimulate the research activities in the College of Engineering. These activities include the contribution of new knowledge in engineering science by prosecuting a vigorous program of basic research, the conduct of programs of developmental and applied research as a service to the industries of the State, and the determination of uses for the material resources of the State and thereby to encourage the growth of new industries.

The active research staff consists essentially of the faculty members of the College of Engineering and other divisions of the University. The laboratories of all departments, as well as the newly constructed 60,000-square-foot Rhodes Engineering Research Center, are available to the Office of Engineering Research in its investigations.

Research is the foundation for progress in a modern society. The well-equipped physical facilities and the thoroughly competent professional staff available to the Office of Engineering Research constitute extremely valuable resources for continuing and expanding this research effort.

OFFICE OF INDUSTRIAL AND MUNICIPAL RELATIONS

COLLEGE OF ENGINEERING

Seminars, workshops, symposiums, institutes, short courses, and conferences are conducted for engineers of South Carolina and neighboring states. These activities are designed to keep the engineer abreast of changes in modern technology through a non-credit continuing engineering education program sponsored by the Departments of the College of Engineering and coordinated by the Office of Industrial and Municipal Relations.

Typical programs which have been presented include: "Air and Water Pollution Control," "Engineering Application of Digital Computing," "Quality Control and Materials Testing for Highway Engineers," "Solid State Devices in A-C and D-C Motor Control," "Use of Ceramics in Surgical Implants," "Analog and Hybrid Simulation in Industrial Systems Design," "Equipment Selection and Economics," "Controls and Computations in Power Systems," "Materials for Implant Dentistry," and "Application of Solid State Logic to Industrial Control."

All engineering departments participate in the Junior Engineers' Scientists' Summer Institute (JESSI) in which talented high school students receive a 2-week orientation in the Sciences and Engineering.

Refresher courses are coordinated for the National Engineer-in-Training and the Professional Engineer examinations for engineers employed in the Piedmont region of South Carolina.

With the assistance and support of the Department of Environmental Systems Engineering, continuing education programs in environmental control are made available to state, county and municipal agencies and professional organizations such as the South Carolina Water and Pollution Control Association. These programs take various forms, such as the writing of correspondence manuals for water and wastewater treatment plant operators, and conducting schools, workshops and seminars on various topics in environmental control for both the practicing technician and the official charged with the program administration. A national workshop has been co-sponsored with the Federal Water Pollution Control Administration on "Educational Systems for Operators of Water Pollution Control Facilities."

THE OFFICE OF PROFESSIONAL DEVELOPMENT AND INDUSTRIAL RELATIONS

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

One-fourth of the population of the United States will go back to school this year. More and more people including educators, have abandoned the idea that education is something that takes place during a block of time between six and eighteen (or twenty-two). It is lifelong.

The Professional Development Program is one answer to this "fourth dimension" of education. Now over thirteen years old, the program has served over 1,500 persons in one- and two-week long seminars plus hundreds more in various one- and two-day short courses.

The primary aim of the program is to provide a means and a place for business and industrial people from all levels and all areas to come back to the campus and retread their professional skills, to learn new ones, and to sharpen up old ones in the labs, classroom and during "midnight oil" sessions with other professionals.

Drawing on the full resources and faculty of Clemson University, the Professional Development Program for 1969 offered courses from introductory management to high level computer technology. It served an enrollment from 22 different states and two foreign countries, who represented 101 various business and industrial firms. The staff and faculty were secured from 10 different states and represented 5 universities and 25 different corporations.

A high percentage of participants in several of these courses already held their Ph.D., while quite a few had not completed their baccalaureate programs. This further emphasized the realization among professional people that "learning knows no age limit, nor does it know any skill level."

COLLEGE OF EDUCATION

The College of Education offers a variety of professional services to educational agencies.

OFFICE OF EDUCATIONAL SERVICES

The Office of Educational Services was established in the College of Education in August 1969. In broad terms, its mission is to focus the resources of the University upon problems and needs of public school systems. Among the activities implied in this mission are (1) assisting school systems with their teacher-recruitment programs, (2) assisting school systems with their in-service training needs, (3) cooperating with other institutions of higher education in teacher-education programs.

In-service training needs of school systems may be met either through recommending and arranging consultants for short-term programs, or through the establishing of specially designed courses taught in the school district. These courses include subject areas as well as professional courses required for certification.

The Office of Educational Services also distributes applications for teacher certification in South Carolina and coordinates the administration of the National Teacher Examination in western South Carolina.

Inquiries about the Office of Educational Services activities should be directed to Dr. Myrton A. Packer, Coordinator of Educational Services, College of Education, Godfrey Hall, Clemson University, Clemson, South Carolina 29631.

The following is an official record of the Special Institute courses conducted by the College of Education.

Abbeville School District #50

Summer—1970	Ed 735—Curriculum	Dr. Joseph W. Davis
Fall—1970	Ed 734—Human Growth and Development—	Dr. Joseph W. Davis
	Ed 734—Group Action in Administration—	Dr. John Stevenson

Anderson District #1

Summer—1970	Ed 762—Reading Diagnosis and Remediation—	Dr. Jean Hice
	Ed 863—Practicum in Reading	Dr. Jean Hice

Anderson District #2

Fall—1969	Ed 733—Secondary Education (Reading Diagnosis & Remediation)	Dr. Gordon Gray
Spring—1970	Ed 732—Methods and Materials of Teaching Reading	Mrs. E. Galloway
	Ed 734—Special Institute Course (Group Action in Administration)	Dr. William Pennscott
Summer—1970	Ed 732—Special Institute Course (Fundamentals of Basic Reading)	Mrs. E. Galloway
	Ed 863—Practicum in Reading	Dr. Gordon Gray
Fall—1970	Ed 662—Reading Diagnosis and Remediation—	Dr. Gordon Gray
	Ed 634—Group Action in Administration—	Dr. William Pennscott
	Ed 673—Teaching the Mentally Retarded	Dr. Wieters

Anderson District #4

Fall—1970	Ed 662—Reading Diagnosis and Remediation—	Dr. Everett Putney

Anderson District #5

Summer—1968	Ed 462/762—Reading Diagnosis and Remediation—	Dr. Joseph Culhane
	Ed 487/787—Methods and Materials of Speech Improvement	Mrs. Edith Shelton
Summer—1969	Ed 432/732—SIC Elementary School (Art in the Elementary School)	Mrs. Jean Williams
	Ed 433/733—SIC Secondary School (Voice and Diction)	Mr. James M. Dorris
	Ed 432/732—SIC Elementary School (Teaching Mathematics)	Mrs. Betty Riechert
	Ed 434/734—SIC Current Problems in Education (Problems in Teaching Reading)	Dr. Gray
Fall—1969	Ed 434/734—SIC Secondary Education (Adolescent Growth and Development)	Dr. Chester R. Freeze
Spring—1970	Ed 732—SIC Elementary School (Arts & Crafts in the Elementary School)	Dr. W. W. West
	Ed 797—SIC Audio-visual Aids in Education—	Dr. R. Benson
Summer—1970	Ed 732—SIC Elementary Education (Teaching Reading in the Elementary School)	
	Ed 732—SIC Elementary Education (Teaching Social Studies in the Elementary School)	Dr. O'Tuel
	Ed 733—SIC (New Trends in Secondary English)	Dr. John Idol
	Ed 733—SIC (Teaching English to Slow Learners)	Mr. N. B. Somers
Fall—1970	Ed 881—Individual Testing	Dr. Jack Harris

Commission on Higher Education

Spring—1970	Ed 436/736—Supervision	Dr. L. L. Byrd
Summer—1970	Ed 732—Advanced Elementary School Methods—	Dr. Oren McClure
	Ed 735—Individual and Program Evaluation—	Dr. Oren McClure

Greenwood (ESEA Region III)

Summer—1969	Ed 431/731—SIC Early Childhood Ed. (Growth and Development)	Dr. Jack Harris
	Ed 431/731—SIC Early Childhood Ed. (Practicum)	Mrs. Anne Stafford
Fall—1969	Ed 431/731—SIC Early Childhood Ed. (Curriculum for Early Childhood Education)	Dr. Jack Harris
Spring—1970	Ed 431/731—SIC Early Childhood Ed. (Methods & Materials for Early Childhood)	Dr. Thomas Parry

Greenville County School System

Spring—1970	Ed 813—Educational and Vocational Information—	Dr. Myrton Packer
Fall—1970	Ed 809—Analysis of the Individual	Dr. Thomas Parry
	Ed 662—Reading Diagnosis and Remediation—	Dr. Jean Hice
	Ed—672—Psychology of Mental Retardation—	Dr. Robert Wood
	Ed 433/733—Techniques of Advanced Graphic Arts	Dr. Page Couch

Horry County Department of Education

Summer—1970	Ed 734—SIC Problems in Teaching the Language Arts	Dr. Thomas Douglass
	Ed 734—SIC Problems of Teaching Reading—	Dr. Paul Stanton

Lancaster (ESEA Region V)

Summer—1970	Ed 433/733—SIC (Curriculum in Vocational Education)	Dr. Craig
	Ed 433/733—SIC (Practicum in Vocational Education)	Dr. Champion

Pickens County District A

Summer—1969	Ed 434/734—SIC Problems in Teaching Reading—	Mrs. E. Galloway
Summer—1970	Ed 434/734—SIC Problems in Teaching Reading—	Dr. Gordon Gray
Fall—1970	Ed 605—Principals of Guidance	Dr. Freeze
	Ed 662—Reading Diagnosis and Remediation—	Mrs. E. Galloway

Spartanburg (ESEA Region IV)

Fall—1969	Ed 432/732—SIC Elementary Education (Methods & Materials of Reading Instruction)	Mrs. E. Galloway
	(Practicum in Reading)	Dr. Gordon Gray
Spring—1970	Ed 432/732—SIC Elementary Education	

Agricultural Education. The members of the staff of Agricultural Education visit all beginning teachers for the purpose of assisting them on the job and also for the purpose of collecting information which may prove helpful in improving the work of teacher education at the University. In addition, conferences of teachers are held and consulting services made available in the interest of the professional growth of agricultural teachers, the rendering of service to agricultural communities, and the development of leadership among agricultural youth through the program of the Future Farmers of America.

Information concerning any phase of the in-service education activities in Agricultural Education may be secured by contacting the Head, Department of Agricultural Education, Clemson University.

Trades and Industrial Education. The University, in cooperation with the State Department of Education, is glad to assist those who teach vocational subjects in day trade schools and evening trade and industrial classes by supplying a trained man to assist in the work of organizing classes, organizing courses of study, making plans for teaching evening classes, and actually teaching vocational subjects. Requests for information regarding this service should be addressed to Dr. A. F. Newton, Head, Department of Industrial Education, Clemson University, Clemson, South Carolina 29631.

THE SOUTH CAROLINA RESEARCH COORDINATING UNIT FOR VOCATIONAL EDUCATION

The South Carolina Research Coordinating Unit for Vocational Education is a cooperative venture of Clemson University and the Office of Vocational Education, State Department of Education. The Unit was originally funded under a USOE Grant in 1966. Research Coordinating Unit personnel are currently engaged with educational agencies in survey activities to aid realistic educational programming, research and developmental activities to improve guidance services, development of educational programs to enhance effectiveness of education for disadvantaged youth, and research and developmental activities to impact on the dropout problem. Consultant services are available together with an active program of disseminating research findings to aid public schools interested in developing innovative techniques and approaches.

In cooperation with the Clemson University Library, the RCU has developed an outstanding collection of vocational education research materials. The library maintains a continuing subscription for all ERIC microfiche which are immediately available to all vocational education personnel in the state. This service is available through the RCU capability to duplicate the microfiche. Other research reports and related materials, together with curriculum materials are collected, cataloged and filed from across the Nation.

The RCU dissemination activities have focused on the information needs of teachers, supervisors, administrators, teacher educators and others within the state. Drawing upon the total resources of information systems including ERIC, DDC and DATRIX, a viable information system has been developed.

Other activities of the Research Coordinating Unit include providing technical assistance in research design and proposal preparation, evaluating vocational curriculum materials and equipment, participating in workshops for vocational personnel and developing research competencies. Requests for information and/or service should be addressed to Director, Research Coordinating Unit, Clemson University, Clemson, South Carolina 29631.

VOCATIONAL EDUCATION MEDIA CENTER

The Vocational Education Media Center was designed to prepare and produce instructional materials for all of the vocational education services in South Carolina. This involves all types of instructional materials that can be mass produced and distributed by the service to all teachers teaching the particular subject. The materials are produced in accordance with priorities established between the vocational service and the Vocational Education Media Center. The materials are then distributed by the vocational service.

When materials are distributed, members of the staff conduct workshops with the teachers regarding the utilization of the materials in their classes.

Materials consist of curriculum guides, overhead transparencies, slides, audio tapes, filmstrips and other visual and audio materials. At the present time, the Vocational Education Media Center serves agriculture, distributive education, home economics education, health education, office occupations and trades and industrial education.

For more information regarding this service, contact Director, Vocational Education Media Center, Clemson University, Clemson, S. C. 29631.

SHORT COURSES AND CONFERENCES

The facilities of the University are made available for special meetings, such as farm groups, rural ministers, religious organizations, and scientific societies; and arrangements are made for special short courses in poultry science, beekeeping, food preservation, cotton classing, dairy science, forestry, water supply and sanitation, ornamental nurseries, etc. Such activities, undertaken in the interest of the general welfare, are encouraged by the University.

CERAMIC ENGINEERING FORUM

The Ceramic Engineering Department, in cooperation with North Carolina State University, sponsors an annual Ceramic Engineering

Forum for Ceramic Manufacturers of the Southeast. The meeting place alternates between Clemson University and North Carolina State. This meeting is intended to provide the latest scientific and engineering developments pertinent to Ceramic Manufacturers and to provide a forum for the stimulation of creative thinking.

THE CLEMSON FOREST

This forest area of approximately 17,500 acres lies immediately adjacent to the Clemson University campus. It is a teaching, research, and demonstration facility of the College of Forest and Recreation Resources, and is used extensively as an outdoor laboratory. Numerous research plots and demonstrations are located in the forest, which is an outstanding asset in teaching multiple-use forest resource management.

STUDENT REGISTER

PART VII

GRADUATES OF 1970

ASSOCIATE AND BACHELORS' DEGREES CONFERRED MAY 8, 1970

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Orren Edward Byrd, Jr. --------- Hartsville
Larry Dean Cartee ----------------- Easley
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William Allen Hand ---- San Antonio, Texas
*Stafford Michael Mishoe ------------- Loris
Thomas Connor Moss, Jr. --------- Cameron
James Howell Myers, Jr. ------ Westminster
William Mobley Reese ----------- Columbia
Ronald Parker Townsend -------- Anderson

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*Thomas Winfield Sawyer --------- Monetta
*Richard Monroe Stepp --------- Greenville
James Jacob Wheeler III ------------- Saluda
Thomas Hampton Wright, Jr. -------- Dillon

Animal Science

James Merrill Adams ---------------- Union
Larry Neal Atkinson ------------- Jefferson
*Charles McHenry Banks ---------- Chester
Thomas Raymond Henderson, Jr. -- McCormick
John Franklin McMakin ------------- Lyman
James Oscar Patterson III ----- Spartanburg
Robert Saye Riddle --------- Gastonia, N. C.

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*Bobbie Franklin Ayers, Jr. ---- Orangeburg
*Robert Morris Clayton, Jr. -------- Laurens
**James Mack Cloninger -------- Blackstock
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*Kenneth Dale Dykstra ---- Charlotte, N. C.
Carole Ellis ---------------------- Fort Mill
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*Gail Louise Hanna ------------- Effingham
Ernest Gary Jeffords ---------- Orangeburg
James Leroy Johnson -------- Claymont, Del.
**Champ McMillian Jones, Jr. ----- Clemson
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Linda Ruth Kuisma ------------ Iselin, N. J.
Victor Grainger McKoy ------------- Sumter
John Nicholas McNair ------------- Jackson
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Bruce William Marshall ---- Claymont, Del.
Rodney Earl Martin ----------------- Pelzer
*Louis Behrens Mathis, Jr. ---- Timmonsville
Wilbur Kearse Milhous --------------- Olar
Cathy Lou Moss --------------- Blacksburg
Christopher Kent Rash ----------- Anderson
William Boyd Rhodes III -------- Charleston
Ralph Elliot John Saunders ----- Dover, N. J.
*Donald Thomas Shealy ----------- Seneca
Frank Joe Singletary ------------- Coward
Robert Leslie Smalser ---- Englishtown, N. J.
William Robert Stuart ------------ Clemson
Douglas Eugene Waddell --------- Woodruff
**Jerry Craig Waters --------------- Greer

Dairy Science

John Davis Jordan ---------------- Olanta
Randolph Edward Senn ---------- Newberry

Entomology

David Cosby Arnold ------- West Columbia

Food Science

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*Thomas Alan Gibson ------------- Clemson
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Isaac Leonard Keller ------------- Clemson
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James Gary Ramsey ------------- Chesnee
Ashby Kenneth Smith, Jr. ---- Murrells Inlet
Dwight LaVerne Stewart, Jr. ------ Florence
William Rutledge Thomas ---------- Carlisle
*Walter Virgil Wall, Jr. ---------- Edgefield
Henry Neyle Wilson --------------- Sumter

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COLLEGE OF ARCHITECTURE

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Wayne Marshall Reed ----------- Columbia
Ernest Alfred Schichler ----------- Columbia
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William Marett Warlick ---------- Columbia
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COLLEGE OF EDUCATION

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Cheryl Ruth Riddle -------------- Anderson
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Secondary Education

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James Wilson Brown --------------- Aynor
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Cynthia Gramling Fulmer -- Montgomery, Ala.
*Bruce Acker Gillespie ------ Rosemont, Pa.
Thomas Hayward Hall --------- Sarver, Pa.
*Lydia Lee Hamilton ------------ Greenville
Kathleen Sharon Jones ---------- Greenville
*Minnie Clarice Jones -------------- Clover
Sara Rachel Karesh ---------------- Burton
Hal Michael Kaylor --------- Conover, N. C.
Jack Herbert King -------- Wilmington, N. C.
Douglas Eugene Limbaugh ---------- Easley
**Jeanette Dale McAlister ------- Anderson
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Patricia Ann Mansfield ---------- Columbia
Sherry Lynn Marchbanks ---------- Clemson
Linda Marlene Martin ------------- Clemson
**Ann Sinner Mitchell ---- Burlington, N. C.
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*Mary Ann Osteen -------------- Anderson
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Walter Frank Skilton -------- Andalusia, Pa.
*Leslie Green Vaughan --------- Dorchester
*Joe Hudson Venable, Jr. ----------- Easley
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(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

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Michael Keith Jones ----------------- Greer
David Lane Lee, Jr. ---------------- Sumter
Edwin O'Dell Lesley -------------- Manning
George Gregory Link -------------- Clinton
Harold Wilson Lowrance, Jr.
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James Halbert Moseley, Jr. ------- Greenville
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*Jackie Weyman Smith ------ Norcross, Ga.
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*William Alexander Lashley, Jr. -- Columbia
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Larry McSween Miller --------- Johnsonville
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Russell Arthur Poston ------------ Hanahan
*Arnold Joseph Ramsey ------------ Pauline
David Lawrence Sadowski
--------------------- Oak Ridge, Tenn.
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George Dana Tawes --------- Crisfield, Md.
Danny Lane Turpin ----------------- Easley

Science Teaching

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Edward William Hartling ------ Islip, N. Y.
Margaret Louise Hawkins ---------- Central
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Charlton Boyd Patterson, Jr. --- Spartanburg
David Garvin Porter ---------- Spartanburg
Charles Milton Werner, Jr. -- Travelers Rest

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

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Heath Persons Dobson --------------- Greer
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Ceramic Engineering

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Chemical Engineering

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Charles Jayroe Cole ------------- Columbia
**Bennett Hueston Corpening
---------------------- Asheville, N. C.
Joe Myers Davis -------------- Westminster
*John King Edmonds ------------- Anderson
Benjamin Franklin Ford, Jr. ---- Great Falls
Gary Joel Giegerich ----------- Euclid, Ohio
Susan Providence Glen ---------- Greenville
**Charles Harold Gooding --------- Hampton
***Edwin Fletcher Herrington III
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Clyde Havird Jones, Jr. ---------- Batesburg
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Jerry Brannon Martin ------- West Columbia
Furman Rudolph Morrow, Jr.
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Ronald Wingard Roof ----------- Lexington
Charles Roslyn Rutland -------- Orangeburg
William Bruce Scherler --------- Greenville
Richard Dean Simmons ---------- Anderson
Wilhelmus Cornelis Van Loon
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Civil Engineering

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Daniel Marconi Batten III ------- Charleston
Heyward Harles Bouknight, Jr. --- Columbia
*David Ronald Brabham ------- St. Stephen
James Larry Buckner -------- Rosswell, Ga.
*Michael Glenn Crowe ------------ Marietta
William Horton Garvin --- Greensboro, N. C.
Robert Howard Harris, Jr. ----- Atlanta, Ga.
Robert Arnold Henning -- Scotch Plains, N. J.
William Frederick Holle III -- LaGrange, Ga.
Oscar Stanley King ---------------- Easley
John Frederick McCarty ------ Ware Shoals
Cary Durfey McNamara ---- Alexandria, Va.
**Gleny Spurgeon Marshall -- Moncks Corner
Harvey Raymond Mathias -- West Columbia
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Marion Richardson Rembert, Jr. ----- Sumter
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Michael Leon Walker --------- Spartanburg
Bob Young Weathers -------------- Laurens
Stephen Lee Wright ------ North Charleston

Electrical Engineering

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Reginald Gaines Hargrove ------ Greenville
*Rodger Fulton Hatchell ---------- Effingham
William Hubert Kirby, Jr. -------- Greenville
Dennis Harold Lockwood -- Hackensack, N. J.
*Dennis Leroy Mauney --------- Greenwood
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Jacob Rhodes Rogers III ------------ Dillon
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Eugene Andrew Smith, Jr. -------- St. George
James Robbins Youngblood -- Charlotte, N. C.

Mechanical Engineering

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Robert Anderson Calhoun ------ Metter, Ga.
*James Sumter Carter ------------ Fort Lawn
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*Robert Francis Drennan, Jr. ------ Rock Hill
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*Mark Harris Tennant ------ North Augusta
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***William Russel Walden ---------- Moore
Robert Windsor Wilson, Jr. ------- Woodruff

Metallurgical Engineering

Robert Douglas Ainsworth -- Falls Church, Va.
Geoffrey Benjamin Baker --- Alexandria, Va.

BACHELOR OF CIVIL ENGINEERING

Phatphongs Sudasna Ayudhya --- Bangkok, Thailand

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

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Randall Dean Collins ------------ Lancaster
William Eric DeYoung --------------- Greer
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Ben Allen Gay ---------------- Tucker, Ga.
Daniel Horton III -------------- Ridgeland
*Daniel Edward Hunt ------------ Greenville
*Joseph Johnson Hunter III ------ Greenville
Terry Lockman Long -------------- Mauldin
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Fritz Isham Merkel -------- Cincinnati, Ohio
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John Mullen III ------------------- Sumter
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Michael Douglas Patterson ------ Greenwood
William Gregory Pearce -------- Charleston
Linda Faye Rominger -------------- Sumter
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James Foster Williamson, Jr. ----- Columbia
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BACHELOR OF SCIENCE

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John Bennette Cornwell III ---- Spartanburg
Geddes Marvin Cox III --- Fayetteville, N. C.
Keith Ansel Davis -------------- Greenville
Maynard James Davis, Jr. ------- Winnsboro
Charles Larry Dickson ------ Sandy Springs
Floyd Donald Durham ------------- Pickens
*James Franklin Elrod ---------- Greenville
Robert David Gantt ------------- Greenville
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John Francis Gray -------------- Abbeville
Herman Odell Griffin, Jr. --------- Fort Mill
William Michael Griggs
------------------ Southern Pines, N. C.
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Robert Linn Heverley ----------- Walterboro
Hugh Edward Hurley ----------- Greenville
Albert Edwin Jeffords ----------- Lake City
*Richard Arling Johnson ---- Lancaster, Pa.
Horace Dowling Kinsey --------- Walterboro
Steven Glenn Edward Kuester -- Evansville, Ind.
Robert Lawrence LaForge -------- Greenville
Frederick Lynn Latham ---------- Hanahan
*John Daniel Ledford ----------- Greenville
Jackson Edward McCann, Jr. ----- Abbeville
Joel Wayne McCombs ---------- Greenville
Olin Ronnie McNeely -------------- Pickens
Joel Richard Mahaffey ------ LaGrange, Ga.
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Eugene St. Clair Mellard, Jr. -- Summerville
Robert James Melville ----- Statesville, N. C.
Thomas Anthony Ming ---- Eatontown, N. J.
Hugh Foster Morgan, Jr. ----------- Laurens
Larry William Oates ------------------ York
William Riley Palmer -------------- Gaffney
Richard Joseph Pilo --------- Bellport, N. Y.
James Michael Pizzicato ---- Rochester, N. Y.
William Nelson Poe, Jr. --------- Greenville
James Ferris Poling ------ Winter Park, Fla.
Thomas Marion Slaton --------- Tignall, Ga.
Brice Morris Stone ------------- McCormick
Ray Livingston Vroome, Jr.
-------------- Upper Saddle River, N. J.
William Sanford Ware, Jr. -------- Varnville
William Colmery Webster ------ Greenville
Robert Hollis Williams ------------ Rock Hill
Darrell Moore Young ---------- Timmonsville

Textile Chemistry

Lawrence Bronson Durham, Jr. ---- Arcadia

Textile Science

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William Patrick McGuigan ------- Abbeville
Wade Curtis Mullinnix -------------- Pickens

Textiles

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*John William Gambrell -------- Great Falls
Samuel Alexander Glenn, Jr. ----- Fair Play
Thomas Hugo Klahre ------------ Deal, N. J.
Ben Allen Maynard, Jr. -------- Simpsonville
William Eugene Rhymer, Jr. ----- Winnsboro

COLLEGE OF LIBERAL ARTS

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James Edward Barbary ------- Simpsonville
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Phillip Clark Bodle -------- Cincinnati, Ohio
Joseph Dennis Bolt -------------- Anderson
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Glenn Bowers ------------------ Lancaster
John Lester Brady, Jr. --------- Spartanburg
John Robert Brock, Jr. ----------- Walhalla
Walter Thomas Burriss ------ Brooklyn, N. Y.
Marvin Jennings Caughman ------ Columbia
Michael Sean Caulder ------------ Camden
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James Lane Coley II -------------- Anderson
*Rosemarie Anhold Cothran ----------------- Nordenham, Germany
Henry Clay Cox, Jr. -------------- Anderson
John Redmond Coyle -------------- Easley
William Henry Crocker ---------- Columbia
Nancy Ruth Dannals -------- Maitland, Fla.
*Robert Anthony DeFrancisco -- Derby, Conn.
Horace Christopher Dyar ----------- Seneca
Marshall William Edwards, Jr. ------------------------ Travelers Rest
Glenn Patrick Felton -------- Bayside, N. Y.
Charles Patton Ferguson --------- Rock Hill
James Payton Fields, Jr. ----------- McBee
Carolyn Diann Foster ------------- Duncan
Wayne Richard Garland ------ Upton, Mass.
Wilbur Norman Ginn III ----- Bethesda, Md.
Mark Harris Goldman -- Woodbridge, Conn.
**Lucille Coursen Gordon -- Edgewater, Md.
*Betty Joyce Graham -------------- Clemson
Aaron Harvey, Jr. -------------- Charleston
William Harry Howard --------- Greenville
Cordelia Snyder Hunter ----------- Manning
†*Beverly Jo Jackson ----------- Newberry
Teddee Laura Janas ---- Chihuahua, Mexico
***Sharron Lee Jansen ------------- Sumter
**Horace Steven Johnson ----------- Greer
Judith Drake Jones -------------- Anderson
David Lee Kay ---------------- Greenville
Francis Wilkinson King, Jr. ---- Georgetown
Thomas Simpson Klugh ----------- Clemson
Linda Jo Ladd --------------- Williamston
Gary Edward Ligi ----------- Astoria, N. Y.
*Frances Evans Locklair --------- Holly Hill
Larry Bruce Long -------------- Greenville
Brenda Sharon Manley ---------- Rock Hill
James Maurice Merrill ---------- Greenville
Helen Marion Molten ----------- Greenville
*Dennis Duane Moore ---------- Greenville
*Kathryn Melinda Nixon -- High Point, N. C.
Jeanne Hall Norris ------------- Greenville
John Croft Norton ------------ Ocean Drive
*Richard Louis Oborn ------ Faribault, Minn.
Wayne Robert Osef ---------- Rahway, N. J.
Anne Campbell Peden --------------- Pelzer
Stanley Victor Perez --- San Domingo, D. R.
Robert Michael Pridmore ---- Hickory Grove
*Edward Stuart Pusey ---------- Charleston
George David Rankin III ---------- Clemson
George Dewey Ray --------------- Clemson
Edward Mark Rubich, Jr. -- Willingboro, N. J.
Guy StClaire Sanders III ---------- Bamberg
**Glenn David Shepherd -------- Greenville
Malcolm Duane Shuler ----------- Kingstree
Gerald Wade Smith -------------- Madison
*Harriet Robins Smith ---- Jacksonville, Fla.
†*Thomas Michael Smith ------ Spartanburg
William Alan Smoke ------------ Greenville
William Ray Thomson --------- Honea Path
Edward Charles Townsend, Jr. ---------------------- Cambridge, Md.
*David Phillips Watkins, Jr. ------ Anderson
Ernest William Weaver, Jr. ------- Lake City
Ralph Edward Wempe -------------- Sumter
Robert Krehl Whitney ------------- Clemson
David Frank Williams ---------- Greenville
Leonard Elwin Witt III --- Washington, D. C.
James Goodrich Wright, Jr. -------------------- Coral Gables, Fla.
Vivian Elise Young ---------------- Sumter

SCHOOL OF NURSING

ASSOCIATE IN ARTS

Nursing

Barbara Jean Ashley ---------------- Donalds
Nancy McWhorter Barnett --- Lincolnton, Ga.
*Carol Nixon Campbell ------------ Anderson
Shirley Janet Causey -------------- Mauldin
Dorothy Louise Crocker ----------------- Iva
Catherine Alice David --------------- Salters
*Gloria Martin Driver ------------- Anderson
Kathy Mason Henderson ------- Honea Path
Bertha Dianne Jones --------------- Florence
Anita Delaramaux Macaione ----- Abbeville
Danette Wickun Needham ---- Milford, Conn.
Nancy Margaret Smith --- Greensboro, N. C
Janice Gail Rahn Stamps -------- Anderson
Bennie Sue Strickland ------------ Anderson
***Dorothy Juanita Walker ------- Columbia
Worthlyn Agnes White ---------- Columbia
*Judith Elizabeth Wright ------------- Ward

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

Arthur Jerry Currence ----------------- York
*Charles Ryan Howard, Jr.
---------------------- Glens Falls, N. Y.
Angela Cheryl McAlister ------------- Union

BACHELOR OF SCIENCE

Chemistry

David Paul Baird --------------- Greenville
**Marshall Lynn Deanhardt --------- Belton
**Bethany Sharon Franke ------ Spartanburg

Geology

Michael Luther Capps ---------- Greenville
*Stephen LeRoy Wood ----------- Woodruff

Mathematics

William Robert Blackwell ---------- Clinton
**Margaret June Cely ---------- Greenville
*James Peter Chovan ------- Bethlehem, Pa.
Byran Douglas Earwood --------- Anderson
*Colonel Jack Gaddy, Jr. ------ Myrtle Beach
Barbara Jean Hayes -------- St. Paul, Minn.
†***Robert Edward Jamison II
-------------------- Winter Haven, Fla.
Sidney Martin Kearse -------------- Florence
Richard Stephen Kutzleb ---- Freehold, N. J.
Charles Michael Murphree ---------- Easley
*Judith Anne Nicks ----------- Decatur, Ga.
Randall Charles Phillips -------- Greenville
**Elizabeth Pitts ------------------ Clemson
Bobby Joe Poole ---------- North Charleston
**Virginia Dawn Richbourg Riddle -- Florence
Del Ackerman Rosebrock -- North Charleston
Eulalie Yvonne Seel -------- Rahway, N. J
*Vincent Chester Smoral, Jr. -- Danville, Va.
*Michael Thomlinson Stewart ---- Lake City
**Danny Ray Sutherland ------- Greenwood
Marion Cooper Thompson --------- Manning

Medical Technology

Brenda Gail Argo ---------- Toccoa, Ga.
Nancy Masters Ellenburg ---------- Liberty

Physics

Elisha Remington Baker IV --------- Sumter
*Benny Douglas Bartley ----------- Aiken
*Gordon Heyward Dechman ---- Macon, Ga.
Emil William Heikkila, Jr. --- Clermont, Fla.
*Donald Carson Wilson ------- Greenville

Pre-Medicine

*Milton Donald Alexander, Jr. ----- Brunson
***William Lafayette Betsill, Jr. -- Anderson
Jerry Lane Bodie -------------- Ridge Spring
*William Pinckney Bonner -------- Gaffney
***John Arnold Brennan ----- Galesburg, Ill.
*James Henning Brunson, Jr. ------ Manning
Anthony Andrew Cochet -- North Charleston
*Douglas Michael Conrad ------- Charleston
Charles Harmon Crawford, Jr. ---- Fort Lawn
Roy Charles Eldridge, Jr. ------ Spartanburg
Ralph Cleo Fennell, Jr. ----------- Kingstree
Harrell Lee Gardner, Jr. -------- Darlington
**Stanford Taylor Garnett --------- Columbia
*Richard Wayne Hanna --------- Lake City
Leonard Thomas Henderson ------ Newberry
*John Sylvester Hill ---- Charleston, W. Va.
John Radford Howell, Jr. --------- Williston
James Reid Jackson ---------------- Sumter
Robert Nash Jackson ---------------- Sumter
Thomas Lee Jacobs ----------------- Sumter
Robert Garland Jamison ----------- Conway
*Henry Bennett Kinard III ------ Greenwood
James Melvin Lindsey, Jr. -------- Manning
*Perry Irvine Lupo ------------- Greenville
*John Robert Mann ------------ Orangeburg
Thelbert Johnson Milligan, Jr. -------- Loris
James Ray Mobley --------------- Anderson
Nathan Shadrack Newton, Jr. ------ Clemson
Lester Ray Oliver ---------------- Hartsville
*Lawrence Kent Ray ------------ Walhalla
Raymond Howard Schneider III
---------------------- Pennsauken, N. J.
*Jerry Earl Smith ------ East Northport, N. Y.
Kirby Hatten Smith ------------ Orangeburg
*Rowena Gail Sobczyk ------------ Clemson
William Gary Sturgis ------------ Rock Hill
Goodwin Grove Thomas, Jr. ------ Rock Hill
Michael David Thorne ------------- Jackson
*Ronald Richard Underhill --- Sarasota, Fla.
**William Edward Verross -- Hinesville, Ga.
**Auburn Woods III ------------- Hartsville
**George Frederick Worsham, Jr. ------
------------------------------- Charleston

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* With honor
** With high honor
*** With highest honor
† With departmental honors

MASTERS' DEGREES CONFERRED MAY 8, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Agronomy

Benjamin Crane Morton, Jr. _____ Pendleton

Animal Science

Samuel Baylis Shackelford, Jr. __ Spartanburg

Entomology

John Chapman Morse __ Winston-Salem, N. C.

Forestry

Bobby Lamar Lanford ____________ Woodruff
Arthur Townsend Shearin _____ Darlington

Horticulture

Joseph Frank Garofalo ________ Tickfaw, La.
Alex Joseph Kish ________ Youngstown, Ohio
Archie Jefferson Lewis III ______ McCormick
Jack Rudolf Stang _____ Independence, Ohio
Benjamin Ronald Stepp ____ Flat Rock, N. C.

Microbiology

Donald Lyle Ewert ___________ Inkster, Mich.

Poultry Science

Virgil Ernest Kummero, Jr. ___ Fort Worth, Texas
Jackson Burley Ramsey, Jr. __ Bryson City, N. C.

Zoology

Laura Freeman Bishop _____ Dahlonega, Ga.
Donald Stephen Cherry _____ Paterson, N. J.

COLLEGE OF ARCHITECTURE

MASTER OF CITY AND REGIONAL PLANNING

Michael Keith Bantz ______ North Charleston

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

Everett Joseph Butler ____________ Lexington

MASTER OF EDUCATION

John William Caldwell __________ Greenville
Lewis Paul Coffey _____ Blowing Rock, N. C.
Martha Ledbetter Daniels ___________ Belton
Anne Beall Godbee ________ Ft. Walton, Fla.
James Irby Hightower, Jr. ___________ Greer
John Robert Hilley _____________ Greenwood
Frances Cheatham James ________ McCormick
Johnnie Campbell Lowry ____________ Pelzer
Richard Leon Mobley _______ Savannah, Ga.
Rebecca Burgess Murray __ Greenback, Tenn.
Sara Martin Thornton ____________ Anderson
Margaret Monroe Wagener ________ Clemson

MASTER OF INDUSTRIAL EDUCATION

Micah John LaRoche III __ Wadmalaw Island

COLLEGE OF ENGINEERING

MASTER OF SCIENCE

Bioengineering

Tommy Lee Bridges _____________ Greenville
Francis Martin King, Jr. ________ Greenville

Ceramic Engineering

Robert Lane Mitchell ---------- Atlanta, Ga.

Chemical Engineering

William Daniel Holder ---------- Greenwood
Jerald Paul Peterson --------- Syracuse, Ind.
William Macon Sheppard ------ Orangeburg
Dave Robinson Stokely, Jr. -- Kingsport, Tenn.

Civil Engineering

Jim David Rabon -------------------- Aynor

Electrical Engineering

Raymond Rees Glenn ------ Barberton, Ohio

Engineering Mechanics

Joseph George Neuwirth -------- Greenville

Materials Engineering

Furman Houston Brown ------------ Laurens

Mechanical Engineering

James Alexander Fowler ------ Bennettsville
Thomas Andy Grizzle ----- North Charleston

Water Resources Engineering

Robert Fredrick Edmonds, Jr. ------- Pickens

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF ARTS

Economics

Andy Hubbard Barnett -------- Westminster

MASTER OF SCIENCE

Management

Vincent Daniel Richard Guide ------------------------- McKeesport, Pa.
Jerry Eugene Trapnell ---------- Metter, Ga.

Textile Chemistry

Carroll Monroe Carter, Jr. -- Lumber City, Ga.
Hsuan-wen Sabrina Wu ---- Taipei, Taiwan

Textile Science

Pierre Lucien Seveno ----- Lachute, Quebec

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

English

Edythe Rutherford Lambert -------- Clemson

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

MASTER OF SCIENCE

Chemistry

James Francis Cope ------------ Greenville

Mathematics

Carl Vinson Hinkle, Jr. --- --- Staunton, Va.
Alexia Broughton Latimer -------- Columbia
ulia Karlton Polk ----------- Hammond, La.
Douglas Glenn Smith --- Warner Robins, Ga.
Nicholas Mark Stavrakas -- Charlotte, N. C.
Becky Joyner Tallon ------- Nashville, N. C.

Physics

Charles Edward Kennedy II -- Roanoke, Va.

DOCTORS' DEGREES CONFERRED MAY 8, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Animal Physiology

Thomas Mikell Leland ---------- Summerville
B.S., Presbyterian College; M.S., Clemson University
Dissertation: The Fine Structure of Lutein Cells from the Cyclic and Pregnant Bovine

Entomology

Robert Rhea Nash ---------- Central
A.B., Wesleyan Methodist College; M.S., Clemson University
Dissertation: Isocitrate lyase activity in the alfalfa weevil, **Hypera postica** (Gyllenhal), during summer diapause

Robert Irving Van Hook, Jr. ---------- Florence
B.S., Clemson University
Dissertation: Energy and nutrient dynamics of predator and prey arthropod populations in a grassland ecosystem

Plant Pathology

Harley Furman Cantrell ---------- Hendersonville, N. C.
B.S., Furman University; M.S., N. C. State College of A&E at University of North Carolina
Dissertation: The Effects of Temperature and pH on Growth, Physiology, and Metabolic Activities of **Pythium irregulare** and **Pythium vexans**

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

Clifford Noel Click ---------- Reynoldsburg, Ohio
B.ChE., Ohio State University; M.S., University of Toledo
Dissertation: Some Critical Factors Relating to the Performance of a Pilot-Sized Deep Facultative Lagoon (Field of Specialization: Bioengineering)

William Jay Huffman ---------- Paden City, W. Va.
B.S., West Virginia University; M.S., Clemson College
Dissertation: The Effect of Forced and Natural Convection During Ultrafiltration of Protein-Saline Solutions in Thin, Horizontal Channels (Field of Specialization: Chemical Engineering)

Calvin Boyd Parnell, Jr. ---------- Anthony, N. Mex.
B.S., New Mexico State University; M.S., Clemson University
Dissertation: Electrostatic Force and Charge on Cotton Fibers As Influenced by Absolute Humidity, Dry Bulb Temperature, Fiber Length, and Electric Field Intensity (Field of Specialization: Environmental Systems Engineering)

James Harvey Turner ---------- Stuart, Fla.
B.S., M.S., University of Maine
Dissertation: Fluid Bed Adsorption of Low Concentrations of Sulfur Dioxide in Air Onto Activated Carbon (Field of Specialization: Chemical Engineering)

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY

Engineering Management

Elmer Earl Burch, Jr. ---------- Spartanburg
B.S., M.S., Clemson University
Dissertation: A Factor Analysis Model for Evaluating and Comparing Company Performance

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

James Easton Hendrix ---------- Pensacola, Fla.
B.T.S., Alabama Institute of Technology; M. S. Clemson University
Dissertation: Thermal Degradation of Cellulose and Related Carbohydrates in the Presence of Selected Organic Phosphates

Homer Clyde Odom, Jr. ---------- Laurel, Miss.
B.A., University of Southern Mississippi
Dissertation: Synthetic Approaches to the Eremophilane Sesquiterpene Group

Philip Andrew Spanninger ---------- Quakertown, Pa.
B.S., Philadelphia College of Textiles and Science; M.S., Clemson University
Dissertation: The Mechanism of the Rearrangement of Alkyl Phenyl Ethers: A Study of Intra- and Intermolecular Pathways

HONORARY DEGREES CONFERRED MAY 8, 1970

DOCTOR OF HUMANE LETTERS

Paul Hardin III	Spartanburg, S. C.

DOCTOR OF LAWS

William Jennings Bryan Dorn	Greenwood, S. C.
States Rights Gist Finley	Lookout Mountain, Tenn.

DOCTOR OF SCIENCE

Edward Fred Knipling	Arlington, Va.

BACHELORS' DEGREES CONFERRED AUGUST 8, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE

Agricultural Economics

Charles Michael Cornish ---------- Greenville
Roger William Mudd ---------- Bennettsville
Robert Marvin Segars ---------- Darlington

Agronomy

Samuel David Bass, Jr. -------- Bennettsville
Bates Riley Houck ---------------- Cameron
Willibough Wilkerson Whaley, Jr. --- Marion

Biology

Harvey Allan Brand ------------ Charleston
Keith Darwin Chandler ---- North Charleston
Thomas Gratttan Gambill -- Fayetteville, N. C.
Suzanne Elizabeth Harte ---------- Beaufort
James Morrison Hills, Jr. -------- Georgetown
Edward Francis Irick III ---------- Columbia
Gary Thomas Moore ---------------- Sumter
Kenneth William Schneider ---- Clifton, N. J.
John Edward Settle, Jr. ------------ Hopkins
Dale Lindenberg Theiling -------- Charleston

Dairy Science

Richard Francis Classey ---- Guelph, Ontario
Henry Raymond Jameson ------ Orangeburg
Harvey Smith Peeler, Jr. ----------- Gaffney

Entomology

Richard Scott Needham ------ Milford, Conn.

Horticulture

Thomas Lewis Blake ---------- Burgaw, N. C.
George Morrell ------------ Matawan, N. J.
Frederick Post ----------------------- Aiken

COLLEGE OF ARCHITECTURE

BACHELOR OF ARTS

Pre-Architecture

Emma Jean Jackson ---------------- Marion

BACHELOR OF SCIENCE

Building Construction

*William Everette Cline, Jr. ---- Elnora, N. Y.
Thomas Edwin Grimes III --------- Columbia
Thomas Ferguson Rowand ---- Oaklyn, N. J.
Donald Edward Rutland ----- North Augusta

BACHELOR OF ARCHITECTURE

Warren Willingham Gresham -- Spartanburg
Gregory Scott Hyatt ------------ Wayne, Pa.
William Bailey Kauric ------------ Columbia
Peter Edwin Sherratt ------ Toms River, N. J.

COLLEGE OF EDUCATION

BACHELOR OF ARTS

Elementary Education

*Rachel Ann Byrd -------------- Greenville
Carole Rebecca Cono --------- Denver, Colo.
Sandra Stevens Harper ------------ Clemson
**Susan McCartney Shelton -- Asheboro, N. C.

Secondary Education

Katherine DuPre Belcher -- New Orleans, La.
Ruth Marthalynn Butts --------- Westminster
William Ronald Cann ------------- Anderson
*Janice Roberts Goldstein -------- Greenville
Robert Henry Hurray -- North Plainfield, N. J.
Michael Charles Kasha ------ Brooklyn, N. Y.
Martha Anne Matteson McKinney -- Greenville
Euyless Edwin Miller, Jr. ---------- Walhalla
**Offie Johnson Muschick ------ Mt. Pleasant
John David Traynham -------- Ware Shoals
Kathryn Bowen Weaver ---------- Anderson

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

George William Bell, Jr. ------------ Clinton
Arthur Ray Nichols ----------------- Saluda
Jacob Sidney Riser ---------------- Bowman
Fred Simmons Wilkins, Jr. ------ Blacksburg

Industrial Education

Timothy Charles Daley -------------- Inman
Henry Russell Spivey ------------- Clemson
Colin James Urquhart --------- Orange, N. J.

Science Teaching

Joseph Woodward Kelly, Jr. ----- Greenville

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Ceramic Engineering

Richard James Bennett ------------- Laurens
Vernon Winfred Moore, Jr. -------- Andrews
David Mark Myers ---------- Ashland, Ohio

Chemical Engineering

William Wightman Culler ------ Orangeburg
William Plumer Jacobs, Jr. ---------- Clinton
Danny Allen Rawl ---------- Woodbine, Ga.

Civil Engineering

John Paul Boiter ----------------- Anderson
Michael Glynn Holder ---- Jacksonville, Fla.
Charles Robert Johnson -- Haddonfield, N. .J
Glen David McDowell ---- Willow Grove, Pa.
Robert Bruce Richards --------- Spartanburg
*Michael Lane Sweeney -- Jacksonville, Fla.

Electrical Engineering

Kenneth Wayne Chapman --- Little Mountain
James Robert Duncan, Jr. ---- Baltimore, Md.
Marion Edward Frick -------------- Chapin
Robert Mann Hartley ---------- Mt. Pleasant
John Davis Hightower, Jr. ----- Decatur, Ga.
*William Joseph Peters -------- Spartanburg
Kenneth William Schmidt ----- Baldwin, Md.
Robert Todd Smathers ----------- Greenville
*Peter Kam-Chuen Tang
----------------- Aberdeen, Hong Kong

Mechanical Engineering

Thomas Blackmon Carter, Jr. ------ Rock Hill
Richard Allen Hager II ----------- Hartsville
Henry Grady Hart, Jr. --------- Simpsonville
Larry David Philpott ------------- Walhalla
Churchill Carroll Powers ------ Bennettsville
Hugh Edward Redick ------------ Bishopville
John Charles Rickard --------- Spartanburg
Steven Howard White ---------- Macon, Ga.

Metallurgical Engineering

James Harvey Witherspoon III --- Greenville

COLLEGE OF FOREST AND RECREATION RESOURCES

BACHELOR OF SCIENCE

Forestry

John Harry McDaniel, Jr.	Pickens
Thomas Scott Suit	Anderson
John Buchanan Tamsberg	Charleston

Recreation and Park Administration

Thomas Croswell Baskin, Jr.	Charleston
Douglas James Blattmachr	Garden City, N. Y.
Dewey Keese Bowen	Westminster
George Price Burnett III	Atlanta, Ga.
Edward Joshua Collins, Jr.	Belvedere
Travis Stanley Dawkins	Greenwood
Judson Hood Drennan III	Rock Hill
James Robert Faulkner, Jr.	Greenwood
John Henry Fulmer III	Orangeburg
Ronald Eugene Gray	Allendale
Frank Kennedy Holman III	Sumter
Daniel Cletus Horne	Columbia
Jackie Lee Jackson	Marion
Kenneth Michael Kirkpatrick	Fort Lawn
Larry Clyde Langley	Travelers Rest
Julius Marcellius LaRoche	Gray Court
James Fletcher Maness	Annandale, Va.
James Lloyd Mays	Allendale
Richard Douglas Medlin	Williamston
Frederick Jacob Snell, Jr.	Tarpon Springs, Fla.
Jack Allen Stroud, Jr.	Spartanburg
William George Tillman	Balboa, Canal Zone
John Parnell Turner	Columbia
Jack Lee Walters, Jr.	Columbia
Eugene Marshall West, Jr.	Marion

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS

Arts and Sciences

Donald Paul Beaudoin	Greenville
Stephen Salvatore Bruno	Cartersville, Ga.
Otto Clarence Burrell, Jr.	Greer
*Michael Verne Church	Greenville
James Harrison Cleveland	Seneca
Walton Albert Crosby	Yemassee
James Larry Faulkenberry	Camden
Elton Thomas Fulmer	Williston
Paul Frederick Hlubb, Jr.	Baltimore, Md.
Harold Simon Iseman, Jr.	Sumter
Peter Edwards Nelson	Medfield, Mass.
Alfred Cleveland Nix	Seneca
David Abraham Thomy	Sumter

BACHELOR OF SCIENCE

Industrial Management

Steven William Baker	Lutherville, Md.
Joseph Richard Burton	Rock Hill
Samuel Ramsey Cain III	Union
Bruce Curtis Chilcote	North Charleston
Malcolm Lane Craven	Florence
James Elliott Foster, Jr.	Greenville
Ronald William Grooms	Lugoff
Harry Hyland Howard III	West Orange, N. J.
Arthur Willis Jenkins	Mullins
Milnor Paret Kessler, Jr.	Greenville
Bobby Nathan Key	Belton
William Olin Kirkpatrick	Florence
Jesse Broadus Littlejohn	Spartanburg
James Vernon Livingston, Jr.	Columbia
Bernard Haywood Miller, Jr.	Chester
Christopher Cameron Milliken	New York, N. Y.
Daryle Durand Ogburn	Charlotte, N. C.
Ricky Vernon Priddy	Winston-Salem, N. C.
James Robert Sanders, Jr.	Gaffney
Thomas Spaulding Shull, Jr.	Annapolis, Md.
Larry Glenn Skinner	Liberty
John Earl Wharton	Laurens
Ricky Arnold Wisher	Rock Hill

Textile Science

James David Miller	Walhalla

Textiles

Guy Bernard Leary III	North Augusta

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS

*Carroll Simms Anderson II -- Frankfort, Del.
Judith Ann Bennett ------------ Augusta, Ga.
George John Bush ---------------- Columbia
George Robert Campbell -- Menlo Park, N. J.
John Stevens Foote -------------- Charleston
Eugene Richard Hamilton ---- Cranford, N. J.
James Roy Holcombe ------------- Anderson
*Cathy Dodds Joyner ---------- Mt. Pleasant
Mary Sojourner King --------- Richmond, Va.
Robert Allen Liner, Jr. ---------- Greenwood
Robert Wayne Lorance -------- Isle of Palms
James Douglas Mackintosh III
------------------------ Burlington, N. C.
John Daniel Mitchell -------------- Anderson
Roger Lewis Mull ------------------- Easley
Harold Bernard Powell, Jr. -- Eglin AFB, Fla.
Donna Frances Sammons --------- Greenville
William Dawson Saverance, Jr.
------------------------ Annandale, Va.
James Wesley Scarborough, Jr. ------ Sumter
Mark Anthony Sims -------------- Greenville
Raoul Lawrence Smith ---------- Walterboro
**Franklin Joseph Stephens ------- Walhalla
James Robert Swindell ---------- Newberry
**Katherine Eggers Tillman ------- Edgefield
Ray Lansing Wilson, Jr. ------------- Dillon
Michael Bryant Wingo --------------- Inman
Mildred Alene Woodham --------- Hartsville

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

**Frances Lynn Laurey ---------- Charleston
Grover LaFoy Woods, Jr. ------------- Pelzer

BACHELOR OF SCIENCE

Chemistry

George Curtis Summerell ---------- Florence

Geology

Eric Koester Garland ---------- Climax, N. J.
William James McKee, Jr. -------- Charleston
Kenneth George Petrusky ---- Rahway, N. J.
Heywood Obed Shirer -------------- Sumter
James Murray Thompson, Jr. --------- Sumter

Mathematics

Wilburn Legare Hutto, Jr. ------- Reevesville
*Deborah Wright Pridemore ------ Anderson
Theodore Price Shertzer ----- Baltimore, Md.

Physics

Athanasios George Sembos --- Patras, Greece

Pre-Medicine

Jane Ellen Bartles ---------------- Rock Hill
John Geoffrey Hunt ------ Washington, N. C.
*Kathryn Walters Knoy ------------ Bamberg
George Edward Richardson -------- Clemson
John Elbert Roberts III -------------- Chester
Theron Collier Smith III -------------- Greer
Douglas Glenn Watters -------- Sebring, Fla.
Janieth Kristina Wise ----------- Graniteville

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*With honor
**With high honor

MASTERS' DEGREES CONFERRED AUGUST 8, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Agricultural Economics

Fred James Gassaway -------------- Donalds

Agronomy

Robert Patrick Gambrell ------------ Seneca

Animal Science

Richard Phillip Dellinger ------------ Marion

Entomology

James Joseph Poland -------- Pittsburgh, Pa.

Horticulture

William Brunson Ballard ------------ Clinton
Marvin Singleton Cely, Jr. ----------- Easley
Grady Ansel King, Jr. -------------- Clemson
Louise Carroll Knight -------------- Beaufort
Carroll Theodore Stephens ---- North Augusta
Shing-jy Jocelyn Tsao ---- Taichung, Taiwan

Microbiology

Frank Matthew Dework, Jr. ---- Clifton, N. J.

Nutrition

Howard David Guthrie II ---- Kellogg, Iowa

Zoology

Ronald Lee Snow --------- Morganton, N. C.

COLLEGE OF ARCHITECTURE

MASTER OF ARCHITECTURE

John Walter Wells, Jr. -------- Lexington, Ky.

MASTER OF CITY AND REGIONAL PLANNING

Mahendra Hargovind Parekh------- Ghatkopar, Bombay

COLLEGE OF EDUCATION

MASTER OF EDUCATION

Elizabeth West Aiken --------------- Easley
Charlotte Laverne Barrett ------- Selma, Ala.
Shirley Jean Bonham --------------- Seneca
Helen Kaese Boucher --- Rutherfordton, N. C.
Wilma Bonham Bowie ------------- Chesnee
Samuel Major Brock ---------------- Hodges
Hattie Eugenia Burts --------------- Laurens
Margaret Wright Cain -------------- Sumter
Teryle Wilder Carpenter ------ Racine, Wis.
Shirley Couch Chappell --------- Williamston
Carl Thomas Cloer, Jr. ----- Jacksboro, Tenn.
Katherine Shannon DeVenny ------ Piedmont
William Ernest DeWitt ----------- Darlington
William Clayton Dillard ------------ Seneca
Nancy Anderson Glackin --------- Anderson
Margaret Lee Harden --------- Eastman, Ga.
Seth Schafer Heimlich --------- Timmonsville
Allan Lee Lang ------------ Cincinnati, Ohio
Suzanne Florence Lehotsky --------- Clemson
Doris McMillan Littlejohn ---------- Clemson
Thomas Wesley McGinty ---------- Cowpens
Anne Knight Mullikin ------------ Piedmont
Elizabeth Larsen Neumeister ----- Charleston
Sylvia Evans Nichols ---------- Spartanburg
Roy Samuel Parker -------- Asheboro, N. C.
James Fredrick Reames, Jr. ------ Bishopville
Russell Gordon Rice, Jr. ------ Teaneck, N. J.
Sandra Floyd Riddle ------------- Lake City
John Kelley Segars -------------- Bishopville
Patricia Mae Snoddy ------------ Greenville
Martha Nalley Stansell ------------- Liberty
Elizabeth Lewis Stanzione -------- Hartsville
Barbara Ballentine Stuckey ---------- Easley
Helen Ann Wild ----------- North Charleston
Jane Williams Williams ------------- Easley
Vivian Lee Wommack --------------- Easley

MASTER OF INDUSTRIAL EDUCATION

Steward Lynwood Baylor --------- Kingstree
Richard Martin Cash -------------- Cowpens
Harry Charles Golderer, Jr. -- Brevard, N. C.

COLLEGE OF ENGINEERING

MASTER OF SCIENCE

Ceramic Engineering

David Taylor Ballenger ---------- Gray Court

Civil Engineering

Fulton Vandiver Clinkscales, Jr. -- Greenville

Environmental Systems Engineering

Edwin Clyde Banner III ---------- Salem, Va.
Anderson Mills Kinghorn, Jr. -------- Beaufort

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF ARTS

Economics

John Doyle Corbin --------------- Enka, N. C.

MASTER OF SCIENCE

Management

Samuel Boyd Daniels, Jr. -------------- Dillon
Frederick Francis Forte --------- Utica, N. Y.
Theodore Edward Jones, Jr. ------ Anderson
Robert Edward Pruett --------- North Augusta
William Carl Smyre, Jr. ------------ Columbia
Harry Houston Whitfield, Jr. ------ Greenville
Robert Ray Wilson ----------------- Anderson

Textile Science

Roland Lee Connelly ------------ Spartanburg
John Thomas Dukes, Jr. ------------ Waterloo

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

History

Ralph William French --------- Ithaca, N. Y.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

MASTER OF SCIENCE

Chemistry

Barry Rufus Edwards ------------ Greenwood
Ralph Bruce Ferguson ----------- Graniteville
David Jack Stanford ------------ Atlanta, Ga.

Mathematics

Angela Gannon Buzzett --------- Atlanta, Ga.
Joanne Rea Duvall ------------- Salem, Ohio
Carolyn Claire Freeman ---- Dahlonega, Ga.
Margaret McArthur Griffin --------- Williston

Physics

Henry Baxter Odom III ------------- Florence
Ernest Webster Sawyer ------- Sophia, N. C.

Major Course

Arts and Sciences and Agricultural Economics	1
Chemical Engineering and Chemistry and Chemistry-Engineering	3
Chemical Engineering and Chemistry-Engineering	1
Chemistry and Chemical Engineering	1
Chemistry and Chemistry-Engineering	1
Chemistry and General Science	1
Chemistry and Industrial Physics	1
Chemistry and Agricultural Chemistry	1
Civil Engineering and Architecture	1
Civil Engineering and Chemistry and Geology	2
Civil Engineering and Industrial Physics	1
Civil Engineering and Electrical Engineering	1
Civil Engineering and Mechanical Engineering	1
Electrical Engineering and Applied Mathematics	1
Electrical Engineering and Industrial Physics	1
Electrical Engineering and Mechanical Engineering	17
Electrical Engineering and Textile Engineering	1
Entomology and Architecture, five-year	1
Entomology and Pre-medicine	1
General Science and Ceramic Engineering	1
General Science and Education	1
General Science and Electrical Engineering	1
Horticulture and Agronomy	1
Horticulture and Architectural Engineering	1
Horticulture and Civil Engineering	1
Industrial Education and Architecture	1
Industrial Education and Electrical Engineering	1
Industrial Education and Forestry	1
Industrial Engineering and Mechanical Engineering	1
Mechanical Engineering and Textile Engineering	4
Poultry and Vocational Agricultural Education	1
Pre-medicine and Arts and Sciences	1
Pre-medicine and Textile Chemistry	2
Textile Chemistry and Civil Engineering	1
Textile Chemistry and Textile Manufacturing	1
Textile Engineering and Civil Engineering	1
Textile Engineering and Mechanical and Electrical Engineering	1
Textile Engineering and Textile Industrial Education	1
Textile Engineering and Textile Manufacturing	1
Textile Engineering and Weaving and Designing	1
Textile Manufacturing and Mechanical Engineering	1

MASTERS'

Agricultural Economics	82
Agricultural Education	89
Agricultural Engineering	40
Agronomy	29
Animal Science	29
Architecture	6
Bacteriology	6
Biochemistry	1
Bioengineering	6
Botany	4
Ceramic Engineering	64
Chemical Engineering	53
Chemistry	99
City and Regional Planning	2
Civil Engineering	53
Dairy Science	22
Economics	7

Major Course	
Education	378
Electrical Engineering	48
Engineering Mechanics	9
English	29
Entomology	64
Environmental Systems Engineering	26
Forestry	10
History	8
Horticulture	67
Industrial Education	54
Industrial Management	36
Management	28
Materials Engineering	3
Mathematics	96
Mechanical Engineering	63
Microbiology	9
Nuclear Science	3
Nutrition	3
Physics	62
Plant Pathology	17
Plant Physiology	2
Poultry Science	16
Textile Chemistry	50
Textile Industrial Education	1
Textile Science	11
Textiles	1
Water Resources Engineering	26
Wildlife Biology	2
Zoology	62

DOCTORS’

Agricultural Economics	11
Agricultural Engineering	2
Agronomy	13
Animal Physiology	5
Bioengineering	5
Chemical Engineering	15
Chemical Physics	2
Chemistry	55
Civil Engineering	3
Electrical Engineering	5
Engineering Management	6
Engineering Mechanics	5
Entomology	24
Environmental Systems Engineering	2
Materials Engineering	2
Mathematics	16
Mechanical Engineering	6
Nutrition	3
Physics	32
Plant Pathology	7
Zoology	3
TOTAL DEGREES AWARDED 1896-1971	24,454

ASSOCIATE AND BACHELORS' DEGREES CONFERRED DECEMBER 17, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE

Agricultural Economics

Randall Larry Bell -------------- Greenwood
Murray Joel Corman ----- Miami Beach, Fla.
Steve Radley Edwards ------------ Johnston
George Charles Manos ---- Pennsauken, N. J.
*James Russell Sursavage --- Andrews, N. C.

Agronomy

*John Carrol Carrington ----------- Swansea
Thomas Davis Holstein -------------- Monetta
James Manly Kelley ------------ Darlington
Bradley Joel O'Neal ---------------- Fairfax

Animal Science

John Calhoun Cornwell ------------- Chester
Horace David Gilliam, Jr. ------------ Pelzer
John Andrews Patterson ------------- Easley
Earle Rowland II -------------- Wedgefield
Alice Tillman Woodside ---------- Columbia
Michael Clarens Workman -------- Woodruff

Biology

James Luther Alverson, Jr. ----------- Pelzer
Robert Estes Bailey -------- Eatontown, N. J.
George Wayne Brockington ------- Columbia
William Thomas Brooks -------- Decatur, Ga.
Charles Alan Collum --------------- Monetta
Dennis David Donohue --- Cedar Grove, N. J.
Marianne Eismann --------------- Greenville
Alexander Faulkner Fewell, Jr. --- Rock Hill
William Earl Fowler, Jr. -- Wadmalaw Island
David Ruple Hutto ------------- Orangeburg
James Arnold Lehmann ---- North Charleston
Casper Fred Marcinak, Jr. --- McClellanville
Johnnie Frederick Milton, Jr. -- Lake City, Fla.
Paul Charles Myers ------ Winter Haven, Fla.
Charles William Pate ----------- Charleston
Everett William Siedschlag, Jr.
------------------------- West Columbia
Geraldine Wojeck Stanford --------- Marietta
Paul Nicholas Valerio ------ Hamburg, N. Y.
Angus Hammett Warren -------- Charleston

Dairy Science

Samuel Kirk McKeown ------------- Roebuck

Horticulture

James Cleveland Carey, Jr. -------- Clemson
William Roger Crenshaw ---------- Clemson
*Louis Bernard Lynn ------------- Darlington

Poultry Science

Thomas Waring Acker ----------- Anderson

COLLEGE OF ARCHITECTURE

BACHELOR OF ARTS

Pre-Architecture

Jack O'Dell Walker -------------- Columbia

BACHELOR OF SCIENCE

Building Construction

John Howard Frank III ---------- Darlington
*Morris Rea Ritch III -------- Charlotte, N. C.

BACHELOR OF ARCHITECTURE

Ira Vincent Hager ------------- Laurel, Del.
Robert Theodore Matthew, Jr.
----------------------- North Charleston

COLLEGE OF EDUCATION

BACHELOR OF ARTS

Elementary Education

*Peggy Marie Batson	Greenville
*Doris Mitchell Bradberry	Williamston
Rebecca Harper DeFoor	Westminster
Jane Lee Fife	Clemson
Edith Anne Glenn	Anderson
Bonnie McGee Lewis	Anderson
*Carolyn Moore Phillips	Greensboro, N. C.
Jerrie Geel Shaw	Ft. Lauderdale, Fla.
Shirley Rogers Smith	Seneca
**Margaret Scott Snellings Spradlin	Bluefield, W. Va.
Emily Bennett Warren	Mauldin
Erica Jean Wilson	Greenville

Secondary Education

**Peggy Reynolds Alverson	Canon, Ga.
George August Anderson, Jr.	Columbia
James Richard Bowen	Blackwood, N. J.
Patrick Marshall Brown	Lawrence, N. Y.
Cathy Dunn Elder	North
William Henry Gaines	Travelers Rest
Pamela Craft Keeter	Gastonia, N. C.
*Paula Elizabeth Sloan	Union

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

Clayburn Smith Barnette, Jr.	Rock Hill
John Alan Cunningham	Pleasantville, N. J.
Guy Arvin Jenkins	Asheville, N. C.
Thomas Elden Lee	Alcolu
Gary Alan Lillis	Greenport, N. Y.
Joseph Wayne Logan	Chester
John Mart Simmons, Jr.	Mountville

Industrial Education

Samuel Harry Childers	Greenville
Ernest Lerand Gandy	Florence
John Martin Hamrick, Jr.	Gaffney
Kenneth William Lake	Hicksville, N. Y.
Sanford Harold Loef	Gainesville, Ga.
Kirk Morgan McCloskey	Washington, D. C.
Richard Byron Witter	Skaneateles, N. Y.

Science Teaching

Larry Lester Lawson	High Point, N. C.
Charles Edward McGee, Jr.	Wheaton, Md.
Ray Maria McNamara	Greenville
Donald Wayne Richardson	Conway
Robert Ronald Thornton	Glenn Springs
William David Webb	Columbia

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

Thomas Cooper Bethea, Jr.	Dillon
Kenneth Vinton King	Madison

Ceramic Engineering

Wayne Franklin Brimer	College Park, Ga.

Chemical Engineering

Constantine Yates Stevens	Wadmalaw Island

Civil Engineering

Joseph Preston Carter III	Startex
Harold Richard Davis	Orangeburg
Richard Champion Davis, Jr.	Mt. Pleasant
Richard John Dorey	Aiken
Richard Brown Haddock	Kingstree
Haskell David Hardy, Jr.	Laurens
Perry Dean Holcombe	Spartanburg
Warden Winborn Hughes	Hartsville
Robert Stanley Jones	Lake Lure, N. C.
*James Madison Longshore, Jr.	Newberry
David Craig Lynch	Willingboro, N. J.
Robert Daniel Ogletree	Cayce
Robert Harvey Robey, Jr.	Bethesda, Md.
**Dan Milton Earl Rogers	Williamston
Richard Anthony Rydarowski	East Meadow, N. Y.
Robert Charles Sharpton	Orangeburg
Jimmie Ralph Smith	Greenville
Ronald Delano Smith	Piedmont
Charles Kirkland Smoak, Jr.	Orangeburg
William Walter Thompson	Dover, Del.

Electrical Engineering

Thomas Norman Bradley	Greer
James Larry Chandler	Greer
**James Louie Coleman, Jr.	Ridgeway
Thomas Hudson Collins	Winnsboro
Brian Edward Doyle	Closter, N. J.
*Ronald Edward Glenn	Ravenel
Ronald Lester Green, Jr.	Birmingham, Ala.
Larry Clifford James	Columbia
Robert Arnold Knoerr	Seneca
Thomas Charles Meier	Easley
Bruce Edwin Rayle	Richmond, Ind.
Jeff Willard Rowell, Jr.	Easley
William LeRoy Strong, Jr.	Hanahan
Jerry Wayne Traynham	Honea Path
Walter Larry Williams	Greenville

Mechanical Engineering

Robert Wisler Beachy	Atlanta, Ga.
Melvin Neel Browne	Troy
George John Fredrick Bullwinkel, Jr.	Mt. Pleasant
David Ray Dover, Jr.	Spartanburg
Ian Frazer Eisenbrey	Elmer, N. J.
Boyce Tyndall Estes, Jr.	Rock Hill
Charles Fenton Fadeley, Jr.	Lexington Park, Md.
Foster Mitchell Garner	Rock Hill
William James Grayson III	Charlotte, N. C.
David Maxie Hardin	Laurens
Robert Cody Lenhardt	Charleston
Robert Errol Martin	Gray Court
Henry Laurens Mellichamp III	Mt. Pleasant
Russell Paul Muschick	Mt. Pleasant
Dale Roy Schielke	Titusville, N. J.
Andrew George Sidrony	Metuchen, N. J.
Samuel Robert Spann, Jr.	Myrtle Beach

Metallurgical Engineering

Ralph James Brackett	Tampa, Fla.
Vanderbilt Carl Pundt	Chester

COLLEGE OF FOREST AND RECREATION RESOURCES

BACHELOR OF SCIENCE

Forestry

John Carroll Chapman	Winnsboro
*Thomas Daniel Dreher	Summerville
John Edwin Miller	Anderson
John Wotring Tucker, Jr.	Charleston

Recreation and Park Administration

Ransome Williams Anderson	Myrtle Beach
Rex Alan Brown	Cayce
Valerie Jean Carson Bryan	Walterboro
Oscar Lee Grant Carter	Dillon
Ted Eugene Carter	Fort Mill
Ronnie Wayne Cauthen	Heath Springs
William Patrick Charping	Iva
John Leonard Fulmer, Jr.	Avondale Estates, Ga.
Richard Warren Gardner	Cinnaminson, N. J.
Jon Ashford Giles	Greer
Frederick Louis Hiser, Jr.	Bel Air, Md.
Michael Andrew Ingles	Charleston, W. Va.
James Edward Leon	Chatham, Va.
Jewell Pierce McLaurin	Dillon
John Lyon McMurray, Jr.	Greer
*Robert Gene Patterson	Clinton
James Goodlette Taylor	Greenville
John Leon Wade	Hartford, Ark.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS

Arts and Sciences

Ernest Lynn Adams -------- Edgemoor
Norwood Leslie Alessandro -------- Sumter
John Vincent Bonnett III ---- Asheville, N. C.
Roger Dale Bullard -------- Sumter
Kenneth Butler -------- Bergenfield, N. J.
Charles Eugene Cauble -------- Columbia
Jonathan James Couchell -------- Spartanburg
Adriano Demori -------- Cliffside Park, N. J.
Ernest McCullough Duvall -------- Cheraw
Tommy Collis Dykes -------- Anderson
Gerald William Hill -------- Pine Hill, N. J.
Edward Joseph Holland, Jr. -------- Islip, N. Y.
James Edward Lockery, Jr. ---- Spartanburg
Robert Andrew Lyons, Jr. -------- Marietta, Ga
Richard Claude Miller, Jr. -------- Greenville
Harry Galt Moore, Jr. ---- Chattanooga, Tenn.
Francis Mitchell Ott, Jr. -------- Columbia
Everette Orwig Page III -------- Spartanburg
Robert Michael Plante -------- Hanover, N. J.
Phillip Daniel Rogers -------- Easley
Lawrence Ray Tew -------- Greenville
David Vernon White -------- Cheraw
William David Wilburn, Jr. -------- Greenwood
James Michael Woodall -------- Rock Hill

BACHELOR OF SCIENCE

Industrial Management

Andrew Arthur Abbott -------- Wakefield, Mass.
Alan John Anderson -------- Baldwin, N. Y.
John Law Anderson -------- Clinton
Paul Walker Askins -------- Hartsville
Paul Rudolph Bazemore, Jr. -------- Beaufort
Johnny Link Cagle -------- Cayce
Walter Childson, Jr. -------- Philadelphia, Pa.
Henry Laib Cogan -------- Washington, D. C.
Bob Davison Gilbert, Jr. -------- LaFayette, Ga.
Shannon Kathleen Green -------- Sumter
Robert Benjamin Hooks, Jr. -- Winter Park, Fla.
Robert Wynne Houseman -------- Greenville
James Howard Jones -------- Danville, Va.
William Halbert Keeter, Jr. -------- Aiken
Thomas Oliver Mitchum -- Charleston Heights
Richard Scott Nickel -------- Orangeburg
Mark Michel Nowakowski ---- Baltimore, Md.
Ernest Milton Platt, Jr. -------- Georgetown
Edmond Marcum Ragsdale -------- Easley
James Lewis Rivers, Jr. -------- Greenville
John Randal Roberts -------- Charleston
Louis Emile Storen, Jr. -------- Charleston
William Norris Turner -------- Greenville
Edward Allen Wenz -------- Edison, N. J.
Daniel Rufus White, Jr. -------- Gaffney
William Robert Wise III -------- Abbeville
Cecil Gerald Youngblood -------- Hardeeville

Textile Science

James Irby Brown, Jr. -------- Belvedere
Michael Eugene Evans -------- Abbeville

Textiles

Ronald Joe Hogg -------- Greenville
James Edward O'Connor -------- Anderson

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS

John William Barrett -------- Central
***Dale Evelyn Bebko -------- Spartanburg
William Larry Bendt -------- Charleston
Stephen Anthony Bowie -------- Liberty
David Matthew Brown -------- Burlington, N. J.
Charles Donald Cann -------- Anderson
Norman Douglas Crain -------- Westminster
Wess MacLand Dobson -------- Central
Robert Martin Donnelly -------- Cranford, N. J.
Wallace Rockwell Evans III -------- Rock Hill
*Ellen Ann Johnson Hall -------- Clemson
Marian Eileen Langford -------- Orangeburg
Allan Winfield Libby -------- Huntington Station, N. Y.
Joseph Stanley Michalowski, Jr. -------- Sumter
Mary Whitaker Nuckols -------- Aiken
**Ida Louise Powell -------- Fairfax, Va.
*Kathy Wilson Putnam -------- Seminole, Fla.
Donald Lewis Rozier -------- Dillon
John Wesley Webb, Jr. -------- Greenville
Diana Sara Wright -------- Clemson

SCHOOL OF NURSING

ASSOCIATE IN ARTS

Nursing

Audrey Dianne Cockfield ________ Honea Path

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

William Burton Anderson ________ Greenville
*Judith Anne Kossler ____________ Charleston
*Phyllis Ann White __________ West Columbia

BACHELOR OF SCIENCE

Chemistry

**Stephen Michael Blanton __________ Easley
Joseph David Melnik _______ Stratford, Conn.
Charlie Sanders Rigby, Jr. _______ Greenville

Geology

William Miley Rivers, Jr. ____ Moncks Corner

Mathematics

Richard Jonathon Dill ____________ Charleston
Mary Jane Dobbins ______________ Townville

Medical Technology

*Evon Hart Baker ______________ Wedgefield
Lewis Charles Dase ________________ Gaffney
Marika Ann Ellenburg _______________ Liberty
Suzanne Hotinger _________________ Columbia
Frances Marie Moll ________________ Clemson

Physics

Henry Charles Brown _______________ Sumter

Pre-Medicine

**Lyman Ashurst Ducworth, Jr. __ Williamston
Russell Eugene Porges __ Highland Park, N. J.
Ronald Keith Stephens ________ Spartanburg
Thomas William Talbert, Jr. ______ Columbia

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*With honor
**With high honor
***With highest honor

MASTERS' DEGREES CONFERRED DECEMBER 17, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Animal Science

Joe White Nickles ------------------- Donalds

Biochemistry

Donald James Tindall ------------ Columbia

Botany

Margaret Anne Boulware -------- Winnsboro

Horticulture

Alta Randall Kingman ------------- Rock Hill
Cecilia Shun-Tseng Lin ------ Taipei, Taiwan

Microbiology

Lawrence Willis Blakely ------ Simpsonville
Frank Warren Breazeale ---------- Anderson
William Seaphus Brewer, Jr. --------- Belton

Poultry Science

John Falconer Knechtges ----- Newark, Ohio

Wildlife Biology

Larry Edward Warlick ------- Hickory, N. C.

Zoology

Robert Bernard Moorehead, Jr. ---- Charleston

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

Donald Daniel Durham ----------- Piedmont

MASTER OF EDUCATION

Mary Finley Babb ------------------ Easley
Lois Turner Blackwell --------------- Duncan
Joe Kirkpatrick Brown -------- Hickory Grove
Ryland David Crews -------- Richmond, Va.
Barbara Ann Dorrah --------------- Taylors
Ruth Lee Elizabeth Lam ---------- Columbia
Betty Dickson Long -------------- Piedmont
Caroline Sturgis Reese ---------- Ware Shoals
Jane Arndt Shulenburger ----- Newton, N. C.
Judith Chapman Slaughter ---- Sandy Springs
Roston Miels Smith, Jr. ------------ Anderson
Marjorie Ussery Stokes ------------- Seneca
Thomas Jefferson Tisdale, Jr. -------- Sumter
Roger Thomas Titus ------ Gloversville, N. Y.
Ellen Nix Torrence ------------ Atlanta, Ga.
Teresa Gwen Van Duyn
------------------ Ft. Walton Beach, Fla
Jerry Wayne Wise ---------------- Pamplico

MASTER OF INDUSTRIAL EDUCATION

Raymond Sylvester Fedele -- Somerville, N. J.
Oscar Napoleon Vick III ------- Georgetown

COLLEGE OF ENGINEERING

MASTER OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

Lang Ruey Wang ------ Chang-hwa, Taiwan
Tan-Chung Young ----------- Taipei, Taiwan

Bioengineering

Denton McKendree Harold, Jr. ---- New Smyrna Beach, Fla.

Ceramic Engineering

Thedrick Lamont Eighmie ---- Stamford, N. Y.
Evans Allen LaRoche, Jr. ---------- Clemson
Joseph Charles McLarney --- Portville, N. Y.

Chemical Engineering

James Blythe Ledbetter III ----------- Belton
William Michael Morgan -------- Paris, Tenn.

Civil Engineering

Sidney Lee Allison ---------------- Marietta
Murat Fehmi Tasar -------- Istanbul, Turkey

Electrical Engineering

Dhirendra Laxmidas Ashar -- Borivli, Bombay
Robert Lawrence Dobson -------------- Greer
Elliott Holland McGinnis ------- Norfolk, Va.
Richard Perry Pinckney --------- Charleston

Engineering Mechanics

David Van Gurley ------------ Orlando, Fla.

Environmental Systems Engineering

Lester Yerby Pilcher -------------- Columbia
Guy Elmore Slagle, Jr. --- Garden City Beach

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF SCIENCE

Management

Jesse Frank Dillard ----------------- Taylors
Edward Stanley Helfer -------- Slickville, Pa.
Tracy Howard Jackson ------------ Clemson
Lawrence Terry Owen ------- Brevard, N. C.
Albert John Pejack, Jr. ------ Johnstown, Pa.
Elmer Carlysle Whitten, Jr. ------- Walhalla

Textile Chemistry

Marion Washington Oliver, Jr. ---- Charleston

Textile Science

Dharmendra Harilal Batavia -- Madras, India

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

English

Eugenie Graham Comer -------------- Union
Sybil Campbell Sanders ------ Shannon, Ga.

History

Richard Henry Sikes ------------ Greenwood

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

MASTER OF SCIENCE

Chemistry

Jerry Marvin Clemons ------ Fairlea, W. Va.
Louis Raymond Womble, Jr.
-------------------- Rocky Mount, N. C.

Mathematics

Michael Vernon Newman ------- Vidalia, La.

Physics

Burt Howard Colt, Jr. -- Hendersonville, N. C.
Linda Lawson Payne ------- Spartanburg

DOCTORS' DEGREES CONFERRED DECEMBER 17, 1970

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Agricultural Economics

Eugene Anderson Laurent ---------- Bartow, Fla.
B.S., University of Georgia; M.S., University of Nebraska
Dissertation: An Input-Output Study: Economic-Ecologic Analysis in the Charleston Metropolitan Region

Agronomy

Shashi Mohan Rishi ---------- Jabalpur, India
B.S., M.S., University of Allahabad, India
Dissertation: Manganese Availability In Soils As Affected By Fumigants

Animal Physiology

Carlos Frederico Lam, Jr. ---------- Panama City, Panama
B.S., M.S., Clemson University
Dissertation: Milk Secretion of Beef Cows Injected with Estradiol-valerianate During Pregnancy

Chen-Hau Poon ---------- Hong Kong
B.S., M.S., Clemson University
Dissertation: The Ultrastructure of Bovine Endometrial Cells at 3, 8, and 18 Days Post Mating

Nutrition

Sherman Thomas Mayne ---------- Paducah, Ky.
B.S., Southeast Missouri State College; M.S., Southern Illinois University
Dissertation: Isolation and Partial Characterization of Zinc Binding Proteins Found in the Circulatory Systems of Chicks Immediately After Absorption

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

Nuri Akkas ---------- Tavsanli, Turkey
B.S., Robert College, Turkey; M.S., Clemson University
Dissertation: Buckling, Initial Post-Buckling, and Axisymmetric Dynamic Buckling Behavior of Shallow Spherical and Conical Shells (Field of Specialization: Engineering Mechanics)

William Jacob Craft ---------- Rutherfordton, N. C.
B.S., North Carolina State University; M.S., Clemson University
Dissertation: Stress Singularities in an Elastic Matrix Containing Either a Broken or Short Elastic Fiber (Field of Specialization: Engineering Mechanics)

Frederick Adair Dunlap III ---------- Rock Hill
B.S., M.S., Clemson University
Dissertation: Electronically Programmable Physical Testing Instrumentation Applied to Textile Yarns (Field of Specialization: Electrical Engineering)

Rudolf Othmar Friederich -- Wadenswil, Switzerland
B.S., Winterthur College of Technology, Switzerland; M.S., Clemson University
Dissertation: Determination of Binary Adsorption Equilibria of Ethylene-Ethane, Ethane-Propane, and Propylene-Propane of Highly Graphitized Carbon at 25.0°C and Pressures Below One Atmosphere (Field of Specialization: Chemical Engineering)

Frank Louis Lambert -- Metairie, La.
B.S., Tulane University; M.S., Clemson University
Dissertation: An Investigation of the Dynamic Parameters of the Adsorption of Selected Hydrocarbons on a Fixed Bed of Activated Carbon Using a Pulse Chromatographic Technique (Field of Specialization: Chemical Engineering)

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY

Engineering Management

Norman Charles Schaffer -- Ormond Beach, Fla.
B.S., Furman University; M.S., Clemson University
Dissertation: An Analysis of the Assumptions and Undating Procedures of National Input-Output Tables Used in Economic Forecasting and Planning

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

Ibrahim Moayyad Ibrahim --- Haifa, Israel
B.A., Shorter College; M.S., Clemson University
Dissertation: The Effect of Water on the Permeation of Some Permanent Gases in Ethocel

Larry Grant Robinson -- Mulga, Ala.
B.A., Howard College
Dissertation: Part I: A Deuteration Technique and Its Application to the NMR Spectra of Nitrobenzene and Aniline
Part II: Solvent Effects on the Proton Chemical Shifts of Some Monosubstituted Benzenes

James Robert Stout --- Kure Beach, N. C.
B.S., High Point College; M.S., Clemson University
Dissertation: The Configurational Preference in Some Substituted Bicyclic Ketones and Esters

Mathematics

Marilyn Janet Breen -- Anderson
B.A., Agnes Scott College; M.S., Clemson University
Dissertation: A Determination of the Combinatorial Type of a Polytope by Radon Partitions

Billy Joe Holmes --- Robert, La.
B.S., Southeastern Louisiana College
Dissertation: Convergence Theorems for Series of Bessel Functions

Physics

Clarence Rufus Green --- Butler, Tenn.
B.S., East Tennessee State University; M.S., Clemson University
Dissertation: Effects of Bismuth Impurity on the Critical Magnetic Field Curve of Superconducting Tin

DEGREES AWARDED IN 1969-70 BY MAJOR COURSES

ASSOCIATE DEGREES AWARDED IN 1969-70

School of Nursing		17
Nursing	17	
Total Associate Degrees Awarded in 1969-70		17

BACHELORS' DEGREES AWARDED IN 1969-70

College of Agriculture and Biological Sciences		129
Agricultural Economics	14	
Agronomy	10	
Animal Science	9	
Biology	52	
Dairy Science	8	
Entomology	2	
Food Science	4	
Forestry [**]	18	
Horticulture	10	
Poultry Science	2	
College of Architecture		63
Architecture	35	
Building Construction	25	
Pre-architecture	3	
College of Education		200
Agricultural Education	20	
Elementary Education	25	
Industrial Education	34	
Recreation and Park Administration [**]	51	
Science Teaching	12	
Secondary Education	58	
College of Engineering		225
Agricultural Engineering	9	
Ceramic Engineering	14	
Chemical Engineering	40	
Civil Engineering [†]	64	
Electrical Engineering	44	
Industrial Engineering	3	
Mechanical Engineering	45	
Metallurgical Engineering	6	
College of Forest and Recreation Resources [*]		28
Forestry	3	
Recreation and Park Administration	25	
College of Industrial Management and Textile Science		201
Arts and Sciences	61	
Industrial Management	126	
Textile Chemistry	1	
Textile Science	4	
Textiles	9	
College of Liberal Arts		133
Arts and Sciences	133	
College of Physical and Mathematical Sciences		117
Arts and Sciences	10	
Chemistry	7	
Geology	8	

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[*] College of Forest and Recreation Resources established July 1, 1970.

[**] Forestry and Recreation and Park Administration transferred to College of Forest and Recreation Resources July 1, 1970.

[†] Includes one professional degree.

Mathematics	28	
Medical Technology	3	
Physics	6	
Pre-medicine	55	
TOTAL BACHELORS' DEGREES AWARDED IN 1969-70		1,096

MASTERS' DEGREES AWARDED IN 1969-70

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES		45
Agricultural Economics	4	
Agronomy	2	
Animal Science	3	
Dairy Science	1	
Entomology	3	
Forestry	4	
Horticulture	13	
Microbiology	3	
Nutrition	1	
Poultry Science	6	
Zoology	5	
COLLEGE OF ARCHITECTURE		3
Architecture	1	
City and Regional Planning	2	
COLLEGE OF EDUCATION		57
Agricultural Education	1	
Education	50	
Industrial Education	6	
COLLEGE OF ENGINEERING		32
Agricultural Engineering	1	
Bioengineering	2	
Ceramic Engineering	4	
Chemical Engineering	8	
Civil Engineering	2	
Electrical Engineering	3	
Engineering Mechanics	2	
Environmental Systems Engineering	2	
Materials Engineering	1	
Mechanical Engineering	5	
Water Resources Engineering	2	
COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE		17
Economics	2	
Management	10	
Textile Chemistry	2	
Textile Science	3	
COLLEGE OF LIBERAL ARTS		3
English	2	
History	1	
COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES		26
Chemistry	9	
Mathematics	12	
Physics	5	
TOTAL MASTERS' DEGREES AWARDED IN 1969-70		183

DOCTORS' DEGREES AWARDED IN 1969-70

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES		11
Agricultural Economics	1	
Agronomy	2	
Animal Physiology	2	

Entomology	3	
Plant Pathology	1	
Zoology	2	
COLLEGE OF ENGINEERING		13
Agricultural Engineering	1	
Bioengineering	2	
Chemical Engineering	5	
Civil Engineering	1	
Electrical Engineering	1	
Engineering Mechanics	2	
Environmental Systems Engineering	1	
COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES		13
Chemical Physics	1	
Chemistry	5	
Mathematics	2	
Physics	5	
TOTAL DOCTORS' DEGREES AWARDED IN 1969-70		37
TOTAL NUMBER DEGREES AWARDED IN 1969-70		1,333

TOTAL DEGREES AWARDED BY MAJOR COURSES, 1896-1970

Major Course	
ASSOCIATE	
Nursing	86
BACHELORS'	
Agriculture	244
Agriculture and Animal Industry	80
Agriculture and Chemistry	69
Agricultural Chemistry	102
Agricultural Economics	346
Agricultural Education	461
Agricultural Engineering	475
Agronomy	779
Animal Science	799
Applied Mathematics	34
Architectural Engineering	118
Architecture	650
Arts and Sciences	1,625
Bachelor of Science	3
Biology	222
Botany	12
Building Construction	55
Ceramic Engineering	233
Chemical Engineering	442
Chemistry	398
Chemistry and Geology	11
Chemistry-Engineering	43
Civil Engineering	1,454
Dairy Science	401
Education	242
Electrical Engineering	1,814
Elementary Education	60
Engineering Industrial Education	70
Entomology	166
Food Science	14
Forestry	209
General Science	359
Geology	20

Major Course	
Horticulture	490
Industrial Education	410
Industrial Engineering	138
Industrial Management	1,161
Industrial Physics	56
Mathematics	119
Mechanical Engineering	1,562
Mechanical and Electrical Engineering	489
Medical Technology	15
Metallurgical Engineering	15
Physics	93
Poultry Science	48
Pre-architecture	11
Pre-medicine	524
Recreation and Park Administration	136
Secondary Education	116
Science Teaching	44
Soils	9
Textile Chemistry	329
Textile Engineering	1,060
Textile Industrial Education	85
Textile Management	306
Textile Manufacturing	1,045
Textile Science	40
Textiles	29
Veterinary Science	16
Vocational Agricultural Education	729
Weaving and Design	42

Double Majors

Agricultural Chemistry and Arts and Sciences	1
Agricultural Chemistry and General Science	1
Agricultural Economics and Animal Husbandry	1
Agricultural Economics and Vocational Agricultural Education	1
Agricultural Engineering and Civil Engineering	2
Agricultural Engineering and Electrical Engineering	1
Agricultural Engineering and Mechanical Engineering	1
Agronomy and Agricultural Education	1
Agronomy and Vocational Agricultural Education	4
Animal Husbandry and Industrial Management	1
Animal Husbandry and Vocational Agricultural Education	5
Animal Husbandry and Agricultural Education	3
Animal Husbandry and Ceramic Engineering	1
Animal Husbandry and Dairy	2
Architectural Engineering and Architecture, five-year	1
Architecture and Architectural Engineering	11
Architecture and Civil Engineering	1
Architecture, four-year, and Architecture, five-year	18
Architecture, four-year, and Mechanical Engineering	1
Arts and Sciences and Agricultural Economics	1
Chemical Engineering and Chemistry and Chemistry-Engineering	3
Chemical Engineering and Chemistry-Engineering	1
Chemistry and Chemical Engineering	1
Chemistry and Chemistry-Engineering	1
Chemistry and General Science	1
Chemistry and Industrial Physics	1
Chemistry and Agricultural Chemistry	1
Civil Engineering and Architecture	1
Civil Engineering and Chemistry and Geology	2
Civil Engineering and Industrial Physics	1

Major Course	
Civil Engineering and Electrical Engineering	1
Civil Engineering and Mechanical Engineering	1
Electrical Engineering and Applied Mathematics	1
Electrical Engineering and Industrial Physics	1
Electrical Engineering and Mechanical Engineering	17
Electrical Engineering and Textile Engineering	1
Entomology and Architecture, five-year	1
Entomology and Pre-medicine	1
General Science and Ceramic Engineering	1
General Science and Education	1
General Science and Electrical Engineering	1
Horticulture and Agronomy	1
Horticulture and Architectural Engineering	1
Horticulture and Civil Engineering	1
Industrial Education and Architecture	1
Industrial Education and Electrical Engineering	1
Industrial Education and Forestry	1
Industrial Engineering and Mechanical Engineering	1
Mechanical Engineering and Textile Engineering	4
Poultry and Vocational Agricultural Education	1
Pre-medicine and Arts and Sciences	1
Pre-medicine and Textile Chemistry	2
Textile Chemistry and Civil Engineering	1
Textile Chemistry and Textile Manufacturing	1
Textile Engineering and Civil Engineering	1
Textile Engineering and Mechanical and Electrical Engineering	1
Textile Engineering and Textile Industrial Education	1
Textile Engineering and Textile Manufacturing	1
Textile Engineering and Weaving and Designing	1
Textile Manufacturing and Mechanical Engineering	1

MASTERS'

Agricultural Economics	81
Agricultural Education	83
Agricultural Engineering	37
Agronomy	29
Animal Science	26
Architecture	6
Bacteriology	6
Bioengineering	3
Botany	2
Ceramic Engineering	60
Chemical Engineering	49
Chemistry	94
City and Regional Planning	2
Civil Engineering	45
Dairy Science	21
Economics	6
Education	248
Electrical Engineering	40
Engineering Mechanics	8
English	19
Entomology	62
Environmental Systems Engineering	22
Forestry	9
History	6
Horticulture	64
Industrial Education	40
Industrial Management	36
Management	10

Major Course	
Materials Engineering	1
Mathematics	84
Mechanical Engineering	61
Microbiology	6
Nuclear Science	3
Nutrition	2
Physics	58
Plant Pathology	17
Plant Physiology	2
Poultry Science	15
Textile Chemistry	44
Textile Industrial Education	1
Textile Science	5
Textiles	1
Water Resources Engineering	23
Zoology	57

DOCTORS'

Agricultural Economics	8
Agricultural Engineering	1
Agronomy	12
Animal Physiology	3
Bioengineering	4
Chemical Engineering	11
Chemical Physics	2
Chemistry	45
Civil Engineering	2
Electrical Engineering	4
Engineering Management	4
Engineering Mechanics	3
Entomology	21
Environmental Systems Engineering	2
Materials Engineering	2
Mathematics	9
Mechanical Engineering	4
Nutrition	2
Physics	24
Plant Pathology	7
Zoology	3

TOTAL DEGREES AWARDED 1896-1970 23,001

ENROLLMENT BY COUNTIES AND STATES
FIRST SEMESTER, 1970-71

County	*Total*
Abbeville	62
Aiken	134
Allendale	19
Anderson	487
Bamberg	24
Barnwell	29
Beaufort	27
Berkeley	44
Calhoun	17
Charleston	336
Cherokee	58
Chester	56
Chesterfield	40
Clarendon	29
Colleton	57
Darlington	92
Dillon	37
Dorchester	61
Edgefield	31
Fairfield	33
Florence	127
Georgetown	28
Greenville	833
Greenwood	175
Hampton	32
Horry	106
Jasper	14
Kershaw	52
Lancaster	55
Laurens	110
Lee	18
Lexington	104
Marion	36
Marlboro	33
McCormick	10
Newberry	62
Oconee	183
Orangeburg	137
Pickens	512
Richland	235
Saluda	29
Spartanburg	266
Sumter	160
Union	35
Williamsburg	30
York	164
SOUTH CAROLINA TOTAL	5,219

State or Country	*Total*
Alabama	28
Alaska	1
Argentina	1
Arizona	1
Arkansas	5
Australia	2
California	12
Canada	3
Canal Zone	7
Chile	1
Colombia	1
Colorado	4
Connecticut	41
Delaware	26
District of Columbia	12
Ecuador	1
England	2
Ethiopia	1
Florida	160
France	1
Georgia	242
Germany	3
Greece	3
Guatemala	1
Hawaii	3
Hong Kong	4
Illinois	15
India	18
Indiana	9
Indonesia	1
Iowa	3
Israel	2
Japan	2
Kentucky	17
Lebanon	3
Libya	1
Louisiana	18
Maine	3
Maryland	148
Massachusetts	33
Michigan	5
Minnesota	3
Mississippi	4
Missouri	3
Nebraska	1
New Hampshire	5
New Jersey	272
New Mexico	4
New York	152
Nicaragua	1
North Carolina	249
North Dakota	1
Ohio	38
Oklahoma	3
Pakistan	1
Panama	3
Pennsylvania	129
Peru	2
Puerto Rico	4
Rhode Island	9
South Carolina	5,219
Switzerland	1
Taiwan	23
Tennessee	55
Texas	7
Thailand	2
The Philippines	1
Turkey	4
Virginia	132
Washington	3
West Virginia	11
Wisconsni	2
GRAND TOTAL	7,188

ENROLLMENT BY COUNTIES
FIRST SEMESTER, 1970-71 (Greenville and Sumter Campuses)

County	*Greenville*	*Sumter*	*Total*
Aiken		1	1
Anderson	9		9
Berkeley		1	1
Chester		1	1
Clarendon		11	11
Darlington		3	3
Florence		1	1
Greenville	203		203
Kershaw		28	28
Laurens	3		3
Lee		6	6
Orangeburg		2	2
Pickens	5		5
Richland		1	1
Spartanburg	5		5
Sumter		156	156
Williamsburg		1	1
TOTAL	225	212	
SOUTH CAROLINA TOTAL			437

TOTAL ENROLLMENT BY COURSES AND ACADEMIC CLASSIFICATION, CLEMSON UNIVERSITY FIRST SEMESTER, 1970-71

	Freshman Semester		Sophomore Semester		Junior Semester		Senior Semester		
Major Course	1st	2nd	1st	2nd	1st	2nd	1st	2nd	Total
Agriculture	1	0	1	0	1	0	0	0	3
Agricultural Economics	9	3	12	4	19	10	16	9	82
Agriculutral Engineering	13	1	7	2	8	1	5	3	40
Animal Industries	3	1	1	1	2	0	0	0	8
Animal Science	7	6	7	3	10	5	12	8	58
Dairy Science	2	1	3	0	4	0	5	1	16
Poultry Science	6	0	0	0	1	1	3	2	13
Biology	55	8	21	2	16	1	5	3	111
Entomology	3	0	0	0	3	1	4	0	11
Food Science	5	1	1	0	5	2	1	0	15
Microbiology	5	3	13	0	5	0	4	2	32
Plant Science	2	0	2	1	0	0	0	0	5
Agronomy	7	4	5	3	7	0	9	7	42
Botany	0	2	1	0	2	0	1	2	8
Horticulture	8	0	18	2	9	2	9	4	52
Pre-veterinary	53	6	12	1	10	1	1	1	85
Zoology	16	5	12	4	31	12	27	14	121
Sub-Total	195	41	116	23	133	36	102	56	702
Architecture	0	0	0	0	0	1	27[*]	19[†]	47
Building Construction	6	3	9	4	16	5	21[‡]	7	71
Pre-architecture	75	9	32	6	25	12	27	5	191
Sub-Total	81	12	41	10	41	18	75	31	309
Agricultural Education	10	2	9	2	22	7	22	10	84
Early Childhood Education	13	1	1	0	2	0	0	0	17
Elementary Education	103	18	66	16	58	15	23	11	310
Industrial Education	11	6	29	14	40	26	30	10	166
Science Teaching	2	1	5	2	13	2	7	9	41
Secondary Education	86	11	36	22	67	22	51	18	313
Sub-Total	225	39	146	56	202	72	133	58	931
Engineering	53	3	16	1	1	0	0	0	74
Ceramic Engineering	11	1	14	0	8	5	9	4	52
Chemical Engineering	64	4	36	3	25	9	21	13	175
Civil Engineering	95	12	46	10	52	10	41	38	304
Electrical Engineering	95	12	73	11	82	15	37	22	347
Engineering Analysis	6	0	4	0	4	0	2	1	17
Mechanical Engineering	80	17	44	10	35	10	35	33	264
Metallurgical Engineering	0	0	0	0	0	1	1	3	5
Technical Operations	12	5	14	2	5	1	2	2	43
Sub-Total	416	54	247	37	212	51	148	116	1,281
Forestry	58	8	29	1	9	10	5	26	146
Recreation & Park Adm.	57	19	57	16	54	24	57	26	310
Sub-Total	115	27	86	17	63	34	62	52	456
Accounting	10	9	10	2	9	2	5	1	48
Administrative Management	62	10	34	9	22	3	2	2	144
Economics	37	8	16	14	60	22	58	18	233
Financial Management	32	1	13	0	2	0	0	0	48
Industrial Management	71	14	51	14	69	16	86	49	370
Textile Chemistry	9	0	3	2	6	0	2	1	23
Textile Science	7	0	0	2	2	1	0	2	14
Textiles	2	0	0	1	1	3	3	1	11
Sub-Total	230	42	127	44	171	47	156	74	891
Liberal Arts	27	10	16	7	8	0	0	0	68
English	23	4	32	9	24	12	19	5	128
French	5	1	1	2	5	0	3	1	18
German	0	0	0	0	2	0	3	0	5
History	52	3	25	6	22	10	21	12	151
Political Science	58	6	28	11	49	9	22	6	189
Psychology	67	8	28	8	39	11	26	4	191
Sociology	15	4	12	7	7	6	9	5	65
Spanish	1	0	2	0	1	0	1	1	6
Sub-Total	248	36	144	50	157	48	104	34	821
Nursing (A.A.)	18	3	10	4	1	0	0	0	36
Nursing (B.S.)	32	2	22	1	2	2	0	0	61
Sub-Total	50	5	32	5	3	2	0	0	97

Major Course	Freshman Semester 1st	Freshman Semester 2nd	Sophomore Semester 1st	Sophomore Semester 2nd	Junior Semester 1st	Junior Semester 2nd	Senior Semester 1st	Senior Semester 2nd	Total
Chemistry (B.A.)	0	0	1	0	2	0	1	2	6
Chemistry (B.S.)	32	4	13	2	9	4	9	8	81
Geology (B.A.)	0	0	0	0	0	1	1	2	4
Geology (B.S.)	3	0	4	1	4	0	4	2	18
Mathematics (B.A.)	3	2	5	3	2	2	5	2	24
Mathematics (B.S.)	98	9	21	3	29	6	14	4	184
Medical Technology	28	2	3	2	4	2	1	1	43
Physics (B.A.)	0	0	0	1	0	0	0	1	2
Physics (B.S.)	14	1	6	2	5	0	9	1	38
Pre-dentistry	42	4	24	2	13	2	12	2	101
Pre-medicine	75	6	42	4	50	2	36	9	224
Pre-pharmacy	15	1	11	2	0	0	0	0	29
Sub-Total	310	29	130	22	118	19	92	34	754
Total	1,870	285	1,069	264	1,100	327	872	455	6,242

Graduate—Master's Level	720
Graduate—Ph.D. Level	188
Postgraduate	14
Non-degree Students	24
Total	946
Grand Total	7,188
Greenville Campus	225
Sumter Campus	212
M.B.A. Program at Greenville	136
Off-Campus Institutes	277
Total	850
Overall Total	8,038

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[*] Includes twenty-six in the first semester of the fifth year.

[†] Includes fifteen in the second semester of the fifth year.

[‡] Includes four in the first semester of the fifth year.

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clemson university announcements 1972-73

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This general University catalog contains information of particular interest to prospective students and to undergraduates. Students interested in graduate work should request The Graduate School Announcements from the Dean of Graduate Studies and University Research.

The information section on pages 55-85 contains information about admission requirements, expenses, buildings and grounds, housing facilities and ROTC. Educational benefits for veterans and current Selective Service regulations may be found on page 61.

The fifty curriculums of the University are listed on page 114 and the Colleges, Schools, and their major courses are described in detail beginning on the following pages: Agricultural Sciences, page 115; Architecture, page 135; Education, page 142; Engineering, page 164; Forest and Recreation Resources, page 180; Industrial Management and Textile Science, page 183; Liberal Arts, page 194; Nursing, page 202; Physical, Mathematical and Biological Sciences, page 204.

The courses of the University are listed alphabetically in the Description of Courses section beginning on page 230.

For information on admissions, entrance and placement examinations, and transfer credits write the Office of Admissions and Registration. For information on family housing on the campus, write the Associate Director of Housing.

Clemson University offers equal educational opportunity to all persons without regard to race, creed, color, or national origin.

This policy applies in all matters, including:

1. Admission and education of students.
2. Availability of student loans, grants, scholarships, and job opportunities.
3. Employment and promotion of teaching and non-teaching personnel.
4. Student and faculty housing situated on premises owned or occupied by the University.
5. Off-campus housing not owned by the University but listed with the University for referral purposes.
6. Activities conducted on premises owned or occupied by the University.

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UNIVERSITY

RECORD
SEVENTY-NINTH YEAR

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1971-72

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EXPENSES

STUDENT LIFE AND ACTIVITIES

SCHOLASTIC REGULATIONS

DEGREES AND CURRICULUMS

AGRICULTURAL SCIENCES

ARCHITECTURE

EDUCATION

ENGINEERING

FOREST AND RECREATION RESOURCES

INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

LIBERAL ARTS

NURSING

PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES

DESCRIPTION OF COURSES

348119
CLEMSON UNIVERSITY

UNIVERSITY CALENDAR

SUMMER SESSIONS 1971

First Session

(Classes meet Monday-Friday)

May 17	Registration
May 18	Classes begin
June 23, 24	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

June 28	Orientation, new students
June 29	Registration
June 30	Classes begin
July 31	Classes meet
August 4, 5	Examinations
August 7	Graduation

SESSION 1971-72

First Semester

August 16, 17	Orientation, new students
August 18	Registration, all students
August 19	Late registration
August 20	Late registration fee applies
August 20	Classes begin, regular schedule
August 26	Last day for registration
August 26	Last day to add a subject
September 2	Last day to order diploma for mid-year graduation
September 16	Last day to drop a subject without record of drop
October 11	Preliminary reports due
November 10	Last day to withdraw without having grades recorded
November 10	Last day to drop a subject
November 24	Thanksgiving holidays begin after last class
November 29	Classes resume
December 6	Examinations begin
December 16	Mid-year graduation

Second Semester

January 3	Orientation, new students
January 4	Registration, all students
January 5	Late registration
January 6	Late registration fee applies
January 6	Classes begin, regular schedule
January 12	Last day for registration
January 19	Last day to add a subject
January 19	Last day to order diploma for May graduation
February 2	Last day to drop a subject without record of drop
February 28	Preliminary reports due

March 10	Spring holidays begin after last class
March 20	Classes resume
March 31	Last day to withdraw without having grades recorded
March 31	Last day to drop a subject
April 5	Honors and Awards Day—classes suspended at 12 noon
April 24	Examinations begin
May 5	Commencement

SUMMER SESSIONS 1972

First Session

(Classes meet Monday-Friday)

May 15	Registration
May 16	Classes begin
June 21, 22	Examinations

SESSION 1972-73

First Semester

August 21, 22	Orientation, new students
August 23	Registration, all students
August 24	Late registration
August 25	Late registration fee applies
August 25	Classes begin, regular schedule
August 31	Last day for registration
August 31	Last day to add a subject
September 7	Last day to order diploma for mid-year graduation
September 21	Last day to drop a subject
October 16	Preliminary reports due
November 15	Last day to withdraw without having grades recorded
November 15	Last day to drop a subject
November 22	Thanksgiving holidays begin after last class
November 27	Classes resume
December 11	Examinations begin
December 21	Mid-year graduation

Second Semester

January 8	Orientation, new students
January 9	Registration, all students
January 10	Late registration
January 11	Late registration fee applies
January 11	Classes begin, regular schedule
January 17	Last day for registration
January 17	Last day to add a subject
January 24	Last day to order diploma for May graduation
February 7	Last day to drop a subject without record of drop
March 5	Preliminary reports due
March 16	Spring holidays begin after last class
March 26	Classes resume
April 6	Last day to withdraw without having grades recorded

April 6	Last day to drop a subject
April 11	Honors and Awards Day—classes suspended at 12 noon
April 30	Examinations begin
May 11	Commencement

SUMMER SESSIONS 1973

First Session

(Classes meet Monday-Friday)

May 21	Registration
May 22	Classes begin
June 27, 28	Examinations

Second Session

(Classes meet Monday-Friday except as indicated)

July 2	Orientation, new students
July 3	Registration
July 4	Classes begin
August 4	Classes meet
August 8, 9	Examinations
August 11	Graduation

PART I

PERSONNEL

PART I—Personnel

BOARD OF TRUSTEES

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James F. Byrnes	Columbia
Winchester Smith	Williston
Robert R. Coker	Hartsville
James C. Self	Greenwood
Frank J. Jervey	Clemson
Patrick N. Calhoun	Charlotte, N. C.

TERM EXPIRES 1974

A. M. Quattlebaum	Florence
L. D. Holmes	Johnston
E. Oswald Lightsey	Hampton

TERM EXPIRES 1976

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W. Gordon McCabe, Jr.	Greenville
T. Kenneth Cribb	Spartanburg

A. W. Rigsby, *Secretary*	Clemson

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1971

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Henry C. Chambers	Beaufort
B. R. Littlejohn, Jr.	Spartanburg
James D. McNair	Aiken
James R. Morrow	Greenville
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Albert D. Oliphant	Chester
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John M. Spratt	York
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Taze Leonard Senn, Ph.D.	*Head, Department of Horticulture*
Bobby Dale Barnett, Ph.D.	*Head, Department of Poultry Science*

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* Agricultural Education curriculum is jointly administered by the College of Agricultural Sciences and the College of Education.

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* On leave.

† Agricultural Education curriculum is jointly administered by the College of Agricultural Sciences and the College of Education.

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P. A. Steiner, J. R. Warner, J. C. Wells, W. C. Whitten, A. M. Bloss, *ex officio;* G. E. Coakley, *ex officio;* Susan Delony, *ex officio;* K. N. Vickery, *ex officio.*

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N. R. Page, *Chairman;* R. R. Kimmett, H. T. Polk, J. J. Porter, J. C. Carey, *ex officio.*

SPECIAL ADVISORY COMMITTEE ON USE OF RADIOACTIVE MATERIALS:

R. W. Henningson, *ex officio, Chairman;* H. R. Bungay, D. E. Turk, W. K. Willard, W. E. Berry, *ex officio.*

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E. H. McCarter, *Chairman;* E. J. Clark, Rose Godbout, J. C. Newton, D. C. Prince, J. W. Weeden, F. M. Young, Jr.

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Melvin Eugene Barnette, M.S.	*Budget Director*
William F. Geer, Jr., B.S.	*Senior Accountant*
Vivian Raymond Harrell	*Data Processing Supervisor*
Elmer H. McCarter, M.B.A.	*Financial Analyst*
Alden Lee McCracken, B.S.	*Supervisor of Grants and Contracts*
Clyde E. Woodall, M.S.	*Administrative Specialist*

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Carl Edwin Henson, B.S.	*Payroll Supervisor*
Coy Harold Howard	*Accounts Payable Supervisor*
James Thomas Roberts, B.S.	*Accountant*
William Allen Thompson, B.S.	*Accounting Manager*
Joseph Shelor Walker, B.S.	*Bursar*

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John B. Gentry, Ed.M.	*Director of Personnel*
Ray L. Thompson, B.S.	*Associate Personnel Director*
Walter E. Berry, B.S.	*Safety Coordinator*
William J. Stamey	*Insurance Assistant*

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Roy Marcus Rochester, B.E.E., P.E.	*Director of Physical Plant Division*
Daniel Jerry Boyer, M.Arch., A.I.A.	*Superintendent of Planning and Engineering*
James Cleveland Carey, B.S.	*Superintendent of Grounds and Special Services*
George Carlisle Jones, B.S. in E.E.	*Superintendent of Buildings*
James Durham Martin, M.S.	*Assistant Superintendent of Grounds and Special Services*
Walter Aubrey Moore, B.S. in M.E.	*Assistant Plant Engineer*
Julian Leonidas Murph, B.S. in C.E., P.E.	*Assistant Superintendent of Planning and Engineering*
James Allen Stanley, Jr., B.S. in M.E.	*Supervisor of Work Order Planning*
Jack William Weeden	*Chief of Security*

PURCHASING DIVISION

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Jack Norman Wilson, B.A.	*Senior Accountant, Property Control*

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Henry Hughes Hill, Jr., B.S.	*Director of Auxiliary Enterprises*
William Drye Cromer	*Supervisor, Central Office Services*
Charles Dimmock	*Assistant Director of Auxiliary Enterprises*
Thomas Roy Rhymes	*Manager, Laundry*
Ernest Chisolm Watson, B.S.	*Associate Director of Housing*
John William Young, Jr., B.M.E.	*Manager, Auxiliary Services*

THE CLEMSON HOUSE HOTEL

Verner Eugene Cathcart	*Manager*

ADMINISTRATIVE COUNCIL

R. C. Edwards, *President;* M. A. Wilson, *Vice President for Business and Finance and Comptroller;* M. E. Barnette, W. T. Cox, J. B. Gentry, H. H. Hill, T. N. Hinton, Victor Hurst, E. S. Liberty, S. G. Nicholas, R. M. Rochester, and A. W. Rigsby, *Secretary.*

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Stanley G. Nicholas, B.S.	*Vice President for Development*

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Joseph E. Sherman, B.S.	*Director of Alumni Relations*
George M. Moore, B.S.	*Associate Director of Alumni Relations*
John C. Mann, B.A.	*Alumni Editor*
Joseph J. Turner, B.S.	*Alumni Field Representative*

PLANNING AND CORPORATE RELATIONS

James L. Strom, B.S.	*Director*

PUBLIC RELATIONS

Melvin C. Long, B.S.	*Director of Public Relations*
John L. Allen, B.A.	*Editor, University News Bureau*
J. Ross Cornwell, M.A.	*Associate Editor, News Bureau*
Allen M. Sale, Jr., B.A.	*Publications Editor*

UNIVERSITY COMMUNICATIONS CENTER

William Harry Durham, M.A.	*Director, University Communications Center*
James Pearson Burns	*Manager, Technical Services*
Earl Thurman Cosens	*Chief Engineer*
Diane E. Hadley, B.A.	*Artist*
Charles William Haralson	*Supervisor, Central Photography*
William E. Osteen	*Producer-Director*
Ann H. Price, B.A.	*Writer*

CLEMSON ALUMNI ASSOCIATION

1971

Officers

President	Thomas C. Breazeale, '42	Knoxville, Tenn.
Vice President	Ernest B. Rogers, '48	Clemson, S. C.
Secretary	Joe Sherman, '34	Clemson, S. C.
Treasurer	Trescott Hinton	Clemson, S. C.

National Council

District 1	Daniel S. Lesesne, '38	Mt. Pleasant, S. C.
District 2	Virgil F. Linder, Jr., '69	Columbia, S. C.
District 3	Ernest B. Rogers, '48	Clemson, S. C.
District 4	I. L. Donkle, '49	Greenville, S. C.
District 5	John K. Benfield, '41	York, S. C.
District 6	Billy G. Rogers, '49	Dillon, S. C.
S. C. At-Large	William G. DesChamps, '38	Bishopville, S. C.
Georgia	Lawrence Starkey, '56	Atlanta, Ga.
N. Carolina	J. Garner Bagnal, '34	Statesville, N. C.
U. S. At-Large	Thomas C. Breazeale, '42	Knoxville, Tenn.
U. S. At-Large	Davis T. Moorhead, '54	Annandale, Va.
Faculty Delegate	Hugh H. Macaulay	Clemson, S. C.
Student Delegate	Gerry Hough, '72	Annapolis, Md.
Ex officio	George H. Aull, Jr., '44	Alexandria. Va.
Ex officio	Robert C. Edwards, '33	Clemson, S. C.
Ex officio	Stanley G. Nicholas	Clemson, S. C.
Ex officio	T. Carroll Atkinson, Jr.	Marion, S. C.
Ex officio	Chris Suber, Jr.	Anderson, S. C.

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Walter Thompson Cox, B.S.	*Vice President for Student Affairs and Dean of Students*
Kenneth Notley Vickery, B.S.	*Assistant Vice President for Student Affairs and Dean of Admissions and Registration*

OFFICE OF THE DEAN OF STUDENTS

Walter Thompson Cox, B.S.	*Dean of Students*
William V. Bost, J.D.	*Assistant to the Vice President for Student Affairs*
Frank Alan Burtner, Ph.D.	*Director of Fraternity Affairs*
Cathy Anne Campbell, B.A.	*Assistant Dean of Women*
George Edward Coakley, B.S.	*Assistant Dean of Students*
Susan Goodwin Delony, M.S.	*Assistant Dean of Students*
Frank James Howard, B.S.	*Assistant to the Vice President for Student Affairs*
John C. Newton, B.S.	*Assistant Dean of Men*

OFFICE OF ADMISSIONS, REGISTRATION, AND FINANCIAL AID

Kenneth Notley Vickery, B.S.	*Dean of Admissions and Registration*
Gertrude Ramsay Bailey	*Recorder*
Eugenie Ventre Bartmess, M.S.	*Schedule Coordinator*
Reginald Justin Berry, B.S.	*Registrar*
Arnold Mandigo Bloss, B.S.	*Director of Financial Aid*
Albert B. Marx, M.S.	*Associate Director, Admissions and Registration*
William Richard Mattox, M.S.	*Assistant Director of Admissions*
Stanley B. Smith, Jr., M.A.	*Admissions Officer*

RESIDENCE HALLS OFFICE

Manning N. Lomax, B.S.	*Director of Residence Halls*
Joel L. Felsburg, M.S.	*Manager of Residence Halls*
Robert W. Robinson, Jr., B.S.	*Manager of Residence Halls*

PLACEMENT OFFICE

Davis Gregory Hughes, M.Ed.	*Director of Placement*

COUNSELING CENTER

Virginia Smith Hardie, Ed.D.	*Counseling Psychologist*
John Randolph Anderson, M.S.	*Counselor*
John F. Mulkeen, Ed.D.	*Counselor*

STUDENT HEALTH SERVICE

Judson Elam Hair, M.D.	*Director of Student Health Service*
Donald K. Freeman, M.D.	*Psychiatrist*
John Richard Vaughn, M.D.	*Physician*
Ruth Durham, R.N.	*Director of Nurses*

MUSIC ACTIVITIES

John Harrison Butler, Ed.D.	*Director of Concert Band and Manager of Concert Series*
Bruce F. Cook,* M.A.	*Director of Tiger Band*
James Kelly Copenhaver, M.M.E.	*Acting Director of Tiger Band*
Joseph Earl Jackson, M.A.	*Director of Choral Music*

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* On leave.

UNIVERSITY UNION AND YMCA

Buford E. Trent, M.E.	*Director of University Union and YMCA*
Nash Newton Gray, B.S.	*Associate Director, YMCA*
Otis Duell Nelson, M.R.E.	*Associate Director, YMCA and Foreign Student Adviser*
William Carlisle Wooten, B.C.E.	*Youth Director, YMCA*

ATHLETIC STAFF

Henslee Clifford McLellan, M.S.	*Director of Athletics*
George U. Bennett, B.S.	*Assistant Director of Athletics*
Robert C. Bradley, B.S.	*Sports Information Director*
James Banks McFadden, B.S.	*Director of Intramural Athletics*
Eugene P. Willimon, B.S.	*Executive Secretary, IPTAY*
Duane Frederick Bruley, Ph.D.	*Head Coach, Tennis*
Harold N. Cooledge, Jr., Ph.D.	*Head Coach, Fencing*
H. C. Greenfield, M.S.	*Head Coach, Track and Cross Country*
Ibrahim M. Ibrahim, Ph.D.	*Head Coach, Soccer*
Cecil Wayne Ingram, M.S.	*Head Coach, Football*
Robert Morgan Jones, B.S.	*Head Coach, Golf*
Taylor Osborne Locke, B.A.	*Head Coach, Basketball*
Carl Manning McHugh, B.S.	*Head Coach, Swimming*
Billy Hugh Wilhelm, A.B.	*Head Coach, Baseball*

ATHLETIC COUNCIL

K. N. Vickery, *Chairman;* T. D. Efland, W. J. Lanham, R. W. Moorman, B. J. Prochaska, J. V. Reel, J. L. Young, Corrine Sawyer, *President, Faculty Senate, ex officio;* G. H. Aull, Jr., *Alumni Member;* T. C. Breazeale, *Alumni Member;* T. C. Atkinson, Jr., *IPTAY Member;* Chris Suber, *IPTAY Member;* L. D. Hefner, *Student Member;* W. T. Lavender, *Student Member.*

LITTLEJOHN COLISEUM

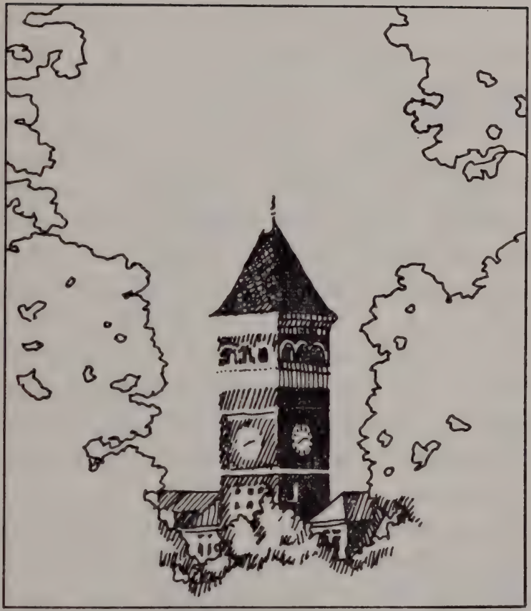
Robert William Smith, B.S.	*Supervisor of Littlejohn Coliseum*

UNIVERSITY BOOKSTORE

John C. Cureton	*Manager of University Bookstore*

UNIVERSITY CANTEENS

F. D. Miller	*Manager of University Canteens*



PART II

INFORMATION

PART II—Information

GENERAL INFORMATION

Clemson is a land-grant, state-supported university. Clemson is fully accredited by the Southern Association of Colleges and Schools. Curriculums are accredited by the American Chemical Society, Engineers' Council for Professional Development, National Architectural Accrediting Board, and Society of American Foresters.

The fifty undergraduate and forty-eight graduate curriculums under the Colleges of Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Physical, Mathematical, and Biological Sciences, College of Nursing, and the Graduate School form a background of training for the hundreds of occupations and professions in which Clemson graduates engage. The University is organized on a basis whereby it retains a clear entity through the interrelationships of colleges, schools, and departments providing a well-balanced fundamental and general educational program.

The enrollment of Clemson has grown from 446 students at the opening of the University in 1893 to 8,890 for the first semester, 1971-72, including 485 at the Greenville and Sumter campuses. Since the opening of the University, through the first semester 1971-72, 64,283 students have attended Clemson, and of this number, 22,648 have been awarded the bachelor's degree. During this same period, 99 associate degrees, 1,856 master's degrees, and 237 Doctor of Philosophy degrees have been awarded.

ADMINISTRATIVE ORGANIZATION

The government of the University is vested in a Board of 13 members, including 6 elected by the Legislature and 7 life and self-perpetuating members, in accord with the Clemson will. The President of the University is the chief executive and administrative officer appointed by the Board of Trustees; and under the President there are four areas of administration, each headed by a chief administrative officer responsible to the President. The organizational units under each of these officers are outlined below:

I. Vice President for Academic Affairs and
Dean of the University

- Dean of Undergraduate Studies
    1. The University Library
    2. The Summer Sessions
- Dean of Graduate Studies and University Research
    1. The Graduate School
    2. The Computer Center
    3. The Office of University Research
- Dean of University Extension
    1. Clemson University at Greenville
    2. Clemson University at Sumter
- A. College of Agricultural Sciences
- B. College of Architecture
- C. College of Education
- D. College of Engineering
- E. College of Forest and Recreation Resources
- F. College of Industrial Management and Textile Science
- G. College of Liberal Arts
- H. College of Nursing
- I. College of Physical, Mathematical and Biological Sciences
- J. The Belle W. Baruch Institute in Forestry, Wildlife Science and Marine Biology
- K. Water Resources Research Institute

II. Vice President for Business and Finance and Comptroller

- A. Accounting Division
- B. Personnel Division
- C. Physical Plant Division
- D. Purchasing Division
- E. Auxiliary Enterprises
- F. The Clemson House Hotel

III. Vice President for Development

- A. Alumni Relations
- B. Public Relations
- C. Communications Center
- E. Deferred Gifts
- D. Planning and Corporate Relations

IV. Vice President for Student Affairs and Dean of Students
    A. Office of the Dean of Students
    B. Residence Halls Office
    C. Office of Admissions, Registration, and Financial Aid
    D. University Union and YMCA
    E. Music Activities
    F. Placement Office
    G. Counseling Center
    H. Athletic Department
    I. Student Health Service
    J. University Canteens
    K. University Bookstore
    L. Littlejohn Coliseum

REQUIREMENTS FOR ADMISSION

Beginning Freshmen. To receive consideration for admission to Clemson, the applicant must present a transcript of his high school record and submit an official copy of his scores for the College Board tests used as an entrance examination. In reaching an admissions decision, the examination scores along with the student's academic preparation, rank in class, and the recommendation of the high school principal will be weighed carefully.

In addition, candidates may qualify for entrance by:

(1) Achieving satisfactory scores on the College Board examinations and presenting a South Carolina High School Certificate (awarded by certificate examination). This provision applies only to adult candidates 21 or more years of age or to those who have served at least two years of active duty in the Armed Forces.

(2) Demonstrating unusual academic ability as a non-high school graduate. In special cases candidates who possess superior high school records and whose College Board scores are above the average for the freshman class may be considered.

Transfer Candidates. Entrance examinations are required of many students in this category, but a number may omit this step. Detailed requirements in this regard are outlined in the sub-section dealing with this subject.

Regardless of one's status relative to entrance examination requirements, all transfer applicants must have an original transcript of their records sent to Clemson directly from each college or university attended. Also, unless so stated on the transcript, the candidate will need to present statements of honorable dismissal and of eligibility to return to the institution last attended.

Applicants meeting the requirements outlined above will be considered carefully with regard to the quality of their credentials. If accepted, work completed in other institutions with a grade at least one letter-grade higher than the lowest passing mark may be evaluated for transfer in terms of equivalent courses in the Clemson curriculum of one's choice.

All Applicants. Various nonintellective factors will be considered in a few cases where it is impossible to make a positive decision on the strength of aptitude and previous academic performance alone.

Application Forms. Forms to be used in applying for admission to the University may be obtained by writing the Office of Admissions and Registration, Clemson University, Clemson, S. C. 29631.

Entrance Examinations. All freshman candidates for admission—and many transfer applicants also—must complete the College Entrance Examination Board SCHOLASTIC APTITUDE TEST. Those who at accredited colleges have completed 30 or more semester hours, or its equivalent, with a "C" average or above on all work attempted are exempt from this requirement. This exception does not apply to those enrolled in technical institutes, or in noncollege parallel programs at institutions offering both transfer and terminal curriculums. For August enrollment, one needs to complete the SAT no later than the preceding January.

In addition and with the exception of those transferring acceptable college credit in mathematics, candidates should take one of the College Board Achievement Tests in mathematics as placement in this subject will be determined by the score one achieves. It is suggested that students sit for the Level I examinations; however, either Level I or Level II is acceptable.

Applicants who will have completed two or more years of high school French, German, Russian, or Spanish and who will enroll in a curriculum which includes a modern foreign language should take the appropriate language achievement test. These candidates may qualify for advanced placement with credit in language on the basis of a satisfactory score on this test.

Students attending unaccredited private schools are strongly advised to complete three achievement tests, including English, mathematics, and one subject of their choice.

August applicants will need to complete all achievement testing no later than the preceding May. Usually it is to one's advantage to take the achievement tests in March of the senior year in high school.

Candidates who have completed the required tests previously may have their scores reported to Clemson by directing a request to the College Entrance Examination Board together with a fee of $2. Others may secure a BULLETIN OF INFORMATION and an application for the tests from their local high school or at one of the Board's offices, the addresses of which are: P. O. Box 592, Princeton, New Jersey 08540, and for residents of the West, P. O. Box 1025, Berkeley, California 94701. Only those scores reported directly to the Clemson University Admissions Office from Princeton or Berkeley will be acceptable.

All candidates are reminded to forward applications for the entrance examinations as indicated in the Bulletin of Information, and not to Clemson University.

Applicants for enrollment in Architecture must also take the ARCHITECTURAL SCHOOL APTITUDE TEST which is given at most schools of architecture in November, January, and March. Applications for this test may be obtained from a school of architecture or from Educational Testing Service, Princeton, New Jersey 08540.

Advanced Placement by Examination. In addition to earning credit by the usual method involving classroom attendance, students may receive credit toward their degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Campus Visits and the Orientation Program. Interviews are not required in considering candidates, nor will the results of interviews affect admissions decisions. Most prospective students, nevertheless, desire and actually need to visit the campus prior to enrollment. Accordingly, the University has scheduled during the summer months a series of two-day orientation programs for entering freshmen, transfer students and their parents. Moreover, all new students are expected to attend one of these sessions.

During orientation one will have the opportunity to discuss his educational objective with an adviser, to preregister for the fall semester, and to learn about student life. Transfer students have their transcripts evaluated and select appropriate courses for their first semester at Clemson.

Regularly scheduled orientation sessions will be held during the months of June and July, with specific dates to be announced later. Those transferring may find it difficult to schedule the appropriate courses if they fail to attend one of these regular sessions; however, a modified session will be conducted in connection with the opening of the fall session for those students living at great distances from the University.

Matriculation. Upon arrival for the opening of the session, new students report to the Office of Admissions and Registration to complete enrollment. A student's matriculation is equivalent to his pledge to conform to the rules of the institution. Any admission gained or matriculation made irregularly is subject to cancellation.

Students from Other Countries. A limited number of well qualified students from other countries are accepted. The application for admission must be in English on the official application form furnished by the Office of Admissions and Registration. Official transcripts of all high school and college level work which the applicant has undertaken should accompany the application. Also, the international candidate must complete the entrance examination referred to above.

EDUCATIONAL BENEFITS FOR VETERANS AND WAR ORPHANS

The Veterans Administration provides educational assistance for veterans and children of deceased or totally disabled veterans who meet requirements of applicable laws and regulations. Any veteran or child of a deceased or totally disabled veteran should communicate with the nearest Veterans Administration Office to determine whether or not he is entitled to any educational benefits.

SELECTIVE SERVICE

Registration. For the benefit of students who become 18 years of age during the school year, provision has been made for such students to register for Selective Service in the Office of Admissions and Registration on the campus. The registration is then sent through channels to the registrant's local board. Regulations provide that registration may be accomplished on the 18th birthday or within five days thereafter.

Deferment. Due to the changes occurring periodically, all registrants should keep themselves informed of current regulations governing deferments. Questions concerning student deferments may be referred to the Office of Admissions and Registration.

Army ROTC Deferment. PMS's are authorized to issue initial ROTC deferments (Class 1-D) for freshman cadets who are eligible upon enrollment. Deferments are maintained throughout the entire course for eligible cadets.

EXPENSES

Settlement of University Fees. The schedule of semester charges for all undergraduate students—full- or part-time, and auditing—is shown on the pages which follow. The entire semester's expenses are due and payable at the beginning of each semester, and no student is officially enrolled until all semester expenses have been satisfied. In special cases the University will accept at the beginning of a semester a noninterest bearing promissory note for a portion of the semester residence-hall rent and semester-plan board fee. Amounts up to $75 for room rent and $110 for board fee may be included in the note. In such cases, a note for the first semester charges will be due October 10, and a note for the second semester charges will be due March 1.

A $60 advance payment of room rent is required for a room reservation for the fall semester. This payment must be made by cash, check, or money order and should be sent to the Residence Halls Manager's Office with the completed "Student Application for Room Reservation" card not later than July 1. The $60 advance payment of room rent will be deducted from the amount otherwise due for the first semester's expenses. All other transactions relating to payments should be conducted with the Accounting Division. All checks and money orders should be made payable to Clemson University. A personal check given in payment of University expenses which is returned by the bank unpaid, immediately creates an indebtedness to the University.

The University reserves the right to adjust charges to current costs.

Past Due Student Accounts. Any indebtedness to the University which becomes past due immediately jeopardizes the student's enrollment, and no such student will be permitted to graduate or register for a subsequent semester or summer school term. Further, any student who fails to pay all indebtedness to the University may not be issued an honorable discharge, transcript, or diploma.

Refund of Academic Fees for Students Enrolled for Less than a Full Semester. No adjustments in charges will be made on a semester's tuition and fees after five weeks from the date classes begin for the semester. Charges for periods of attendance of five weeks or less during a semester shall be made on the following basis:

Two weeks or less	20%
More than 2 but not more than 3 weeks	40%
More than 3 but not more than 4 weeks	60%
More than 4 but not more than 5 weeks	80%
More than 5 weeks	100%

Special provision has been made for a student who is required to discontinue his enrollment to report for active duty in the Armed Forces of the United States. Such students shall be charged for tuition, University fee, and medical fee on a daily pro rata basis, holidays excepted, instead of the percentage basis stated above, provided that such discontinuance of enrollment is the result of circumstances, conditions, or actions over which the student has no control.

Refund of Dining Hall and Residence Hall Fees. Specific information relating to living-expense refunds is given in the sections on dormitories and dining hall.

Schedule of Charges. The schedule of semester charges for the 1972-73 session is as follows:

SCHEDULE OF SEMESTER CHARGES 1972-73 SESSION

(The University reserves the right to adjust charges to current costs.)

Resident of South Carolina (Full-time Student)	
Tuition	$ 75.00
Matriculation Fee	5.00
University Fee	205.00
Medical Fee	35.00
Semester Total Excluding Room and Board	$320.00

Nonresident of South Carolina (Full-time Student)	
Tuition	$200.00
Matriculation Fee	5.00
University Fee	430.00
Medical Fee	35.00
Semester Total Excluding Room and Board	$670.00

Room:

West Campus (Air-Conditioned with Telephones)

Johnstone Hall: New Sections A, F	$205.00
Johnstone Hall: Old Sections D, E, F	180.00
Bowen, Bradley, Donaldson, Norris, Wannamaker Halls	220.00
Benet, Cope, Geer, Sanders, Young Halls	205.00

East Campus (Air-Conditioned with Telephones)

Barnett, High Rise 3, Lever, Manning, Mauldin Halls	220.00

West Campus (Air-Conditioned without Telephones)

Johnstone Hall: Old Sections A, B, C	165.00

Board (5-day plan, Monday through Friday)	220.00
Board (7-day plan)	275.00

Part-time Student. Undergraduate students taking less than 12 semester credit hours will be charged each semester according to the following schedule. These fees do not provide for admission to athletic events, concert series, etc.

	S. C. Resident	*Nonresident Student*
Matriculation Fee (nonrefundable)	$ 5.00	$ 5.00
Tuition (per semester hour)	6.00	16.00
University Fee (per semester hour)	14.00	28.00

Auditing. Charges for auditing are made each semester according to the following schedule:

Tuition (per semester hour)	$ 3.00	$ 8.00
University Fee (per semester hour)	7.00	14.00

Graduate Students. For further information concerning advanced degrees see *The Graduate Bulletin,* which may be obtained from the Office of the Dean of Graduate Studies and University Research.

Late Registration Service Charge. Registration for classes is scheduled for specific days, and certain definite procedures are outlined to prevent or reduce the problems incident to late registration. A student has not completed registration until all required steps have been taken, the final being the return of the Matriculation Card, the Student Directory Card, and if not preregistered for classes, the properly signed Class Registration Card to the Office of Admissions and Registration. Any student failing to register on the specified class registration days will incur a service charge of $10.

Late Payment Fee. Any student who registers for classes on or before a designated date each semester has three additional working days to make satisfactory settlement of all expenses without being charged a Late Payment Fee. Once begun, a Late Payment Fee of $5 per day will be charged until satisfactory settlement of all fees is made.

Definition of Student Residency — Higher Education

A. The word "student" as hereinafter used shall mean any person enrolled for studies in any state institution. The word "residence" or "reside" shall denote continuous and permanent physical presence within this State, provided that temporary absence for short periods of time shall not affect the establishment of a residence. The word "domicile" shall denote a person's true, fixed, and permanent home and place of habitation. It is the place where he intends to remain, and to which he expects to return when he leaves without intending to establish a new domicile elsewhere. It is presumed not to include residency in housing provided for students at state institutions, as residency in such housing is by nature temporary. The word "minor" shall mean a person who has not attained the age of 21 years; the words "emancipated minor" shall mean a minor whose parents have entirely surrendered the right to the care, custody and earnings of such minor, and who no longer are under any legal obligation to support or maintain such minor. The word "parent" shall mean an unemancipated minor's father; or if he has no father, his mother; or if one parent has custody of the minor, the parent having custody; or if there is a guardian or legal custodian of this person, then such guardian or legal custodian, provided that there are no circumstances indicating that such guardianship or custodianship was created primarily for the purpose of conferring the status of an in-state student on such unemancipated minor.

B. South Carolina residency shall be established as follows in determinations of tuition and fees to be paid by students entering or attending state institutions:

1. Persons who have been domiciled in South Carolina for a period no less than twelve months with an intention of making a permanent home therein, including persons in their majority, emancipated minors and unemancipated minors whose parents have been domiciled in this State for no less than twelve months with an intention of making a permanent home herein may be considered South Carolina residents for tuition and fee purposes at state institutions; provided further, that where the parents of an uneman-

cipated minor are living apart or are separated, divorced, or deceased, the residency of the child shall be determined by the place of domicile of the parent or legal guardian with whom the child normally resides. Students making application for residency status shall have the burden of proving that these requirements are met.

2. Where the domicile of a student or his parent or legal guardian changes after his enrollment at a state institution, tuition charges shall be adjusted as follows:

a) When domicile is taken in South Carolina, a student shall not become eligible for residency status for tuition and fee purposes until the beginning of the next semester after expiration of twelve months from date of domicile in this State.

b) When South Carolina domicile is *lost,* residency status for tuition and fee purposes ends on the last day of the semester in which the loss occurs; however, application of this subsection shall be at the discretion of the institution involved.

3. Marriage shall affect determinations of residency for tuition and fee purposes only insofar as it operates to emancipate minors or to evince an intention by the parties to make a permanent home in South Carolina.

C. Where it appears to the satisfaction of officials charged with administration of these provisions that a student has made willful misrepresentations of fact in an attempt to gain residency improperly, tuition and fees past due and unpaid must be repaid, plus interest at a rate of 8 percent per annum, plus a penalty amounting to 25 percent of the nonresident tuition and fees for one semester. No student shall be allowed to receive transcripts or graduate from any state institution until these provisions have been met.

D. Full-time faculty and administrative employees of state institutions, and the husbands, wives, or children of such employees, shall be excluded from the operation of this act.

E. Dependents of members of the armed services and federal employees stationed in South Carolina are permitted to attend the University, if accepted, by paying resident fees without regard to resident status, provided that if such military personnel or employees are ordered away from the State, their dependents may continue to have this privilege while they attend the University.

Any student or prospective student in doubt concerning his residence status must bear the responsibility for securing a ruling by stating his case in writing to the Dean of Admissions and Registration.

Books and Supplies. The cost of books is not included in the Schedule of Semester Charges. The cost of books and supplies at the beginning of the semester will be approximately $50, except for students enrolling in Architecture the cost will be approximately $75.

Student Depository. For the convenience of students, the University operates a depository in the Bursar's Office where money can be deposited and withdrawn as the occasion may demand. This service is purely local. Students are urged to deposit their money and not to keep it in their rooms.

Optional Expenses. It is not possible to give an estimate of a student's expenditures for such amusements as dancing, motion pictures, etc. This depends largely upon the disposition of the student. The University endeavors to reduce to a minimum the temptation to spend money needlessly, but the authorities cannot be responsible for a student's private expenditures. This must be a matter between the student and his parents.

Transcripts. Official transcripts of scholastic records are issued on request. One transcript is furnished free; additional copies are issued for $1 each. Remittances for transcripts should be made payable to Clemson University, but should accompany transcript requests and should be mailed to the Office of Admissions and Registration.

STUDENT HOUSING

The University residence halls will accommodate 5,174, two students being assigned to a room. The University also has 228 individual units for its married students. All unmarried first-year students entering the University directly from high school or preparatory school, not residing with parents, guardians, or close relatives, are required to live in University-owned residence halls. All students in their second or more years in college are eligible to live off campus. Students who are assigned a room in University residence halls will be required to sign a Residence Hall contract relating to terms and conditions of occupancy for the full academic year. Those students living off campus will fill out an off-campus locator card as part of the registration process and will report all changes of address as they occur. The Student Information Office maintains the off-campus locator file and provides information pertaining to off-campus students.

Application for Residence Hall and Advance Payment. An application for residence hall accommodations will be forwarded to those students who are accepted by the University for the fall semester, provided they have paid the $50 admissions deposit. These applications are to be completed and returned with a $60 advance room payment to the Residence Halls Office at the earliest practicable date. After June 1, the $60 advance payment will not be accepted. Students requesting accommodations after that date must pay the full semester's rent in order to receive a room assignment.

Students who have made an advance payment and later decide not to enroll or to live in the residence hall may obtain a refund of the advance payment provided notification of intent and request for refund is received at the Residence Halls Office prior to June 1. When such notification and refund request is not received by the deadline date, no refund of advance payment will be made.

Normally, residence hall accommodations are available to those students who enter the University at the beginning of the second semester; therefore, the advance payment is not now required of students entering at that time.

Notification of Assignments. As soon as room assignments are made, students are advised of the assignment and furnished information regarding occupancy.

Assignment Changes. Students who desire to move from the assigned room may request a room change at the Residence Halls Office. However, no approval of these requests will be made until after the last day for matriculation during any semester. Fee adjustments will be made when moving to a room which rents at a rate different from that of the originally assigned room.

Opening and Closing of Residence Halls. The University residence halls officially open for undergraduate students at 8 a. m. the day prior to matriculation date for new students and close at 8 p. m. the day scheduled for graduation exercises of the term or semester. Residence hall fees cover only the time between the day before matriculation and the scheduled date of graduation exercises or end of term when no graduation exercises are scheduled.

For official holidays which occur during the course of a semester, the University reserves the right to close certain halls and to require students remaining on the campus to move to another hall for the duration of the holiday period.

Student Responsibility for Damages. The University holds residents responsible for any damages other than normal wear that occur to their rooms and furnishings. Damages will be assessed by the University and the student will be billed for repairs or replacements. Students should note on the property certificate immediately upon occupancy any conditions reflecting prior damages which have not been corrected.

Responsibility for Student Possessions. Although every precaution is taken to maintain adequate security, the University cannot assume the responsibility for the loss of or damage to student possessions resulting from any cause.

Refund of Residence Hall Fee. Except for the stated regulations governing the $60 advance payment to reserve a room for the first semester, refunds, when authorized, will be made on a daily pro rata basis.

Reservation of Right to Change Fees and Regulations. The University reserves the right to make changes in its fees, charges, rules, and regulations.

RESIDENCE HALLS

West Campus. Eleven fully air-conditioned residence halls are located on West Campus. Five of these, Benet, Young, Cope, Geer and Sanders Halls, will accommodate 732 students. Each room has walk-in type clothes lockers, individual study desks, single beds, and chairs. A lavatory is installed in each room. The remaining six residence halls, Johnstone, Donaldson, Bowen, Wannamaker, Bradley, and Norris Halls, will accommodate 2,858 students. Rooms in new annexes A and F of Johnstone Hall are equipped similarly to those mentioned above. Rooms in Donaldson, Bowen, Wannamaker, Bradley, and Norris Halls are carpeted and furnished with clothes lockers, individual study desks, single beds, and chairs. Rooms in Johnstone Hall, other than new A and F annexes, are furnished with individual clothes lockers, bunk-type beds, a study table, and chairs. A lavatory is installed in each room. All residence hall rooms, except those in Sections A, B and C in Johnstone Hall, have telephones. (See page 63, Schedule of Semester Charges for rates.)

East Campus. In this area there are 1,584 spaces available in five residence halls. Two of these, Mauldin and Barnett Halls, are modern four-story structures with 144 spaces each. The remaining three, Manning Hall, Lever Hall, and High Rise No. 3, are eleven-story structures all of which were constructed during the last five years. Each will house 432 students. All residence halls are air-conditioned and provide the most modern student accommodations. Rooms are arranged in suites of six accommodating twelve students.

Each room contains two closets, two chest of drawers with wall-hung mirrors, individual reading lamps, desks and chairs. Draperies must be furnished by the occupants. Studies and laundry rooms are available on each floor. Also, available in these residence halls are lounges, kitchenettes, T.V., and recreation rooms. All rooms located on East Campus are equipped with telephones.

MARRIED STUDENT HOUSING

Clemson provides comfortable and economical housing for its married students. There are three housing areas consisting of 78 single Prefab units, 100 East Campus apartments contained in 50 duplex buildings, and 50 Littlejohn apartments in eleven buildings.

All married student housing units have two bedrooms, living room, kitchen, and bath. East Campus apartments are the newest and are equipped with stove and refrigerator. The Littlejohn apartments and Prefabs are not equipped with stoves and refrigerators.

Booklets describing these facilities are available and will be furnished upon request to the Housing Office of the University. Monthly rental fees are: Prefabs, $36; Littlejohns, $51 for interior and $54 for end units; East Campus, $69.

STUDENT FOOD SERVICE

The University dining halls provide several food service plans for the students:

(1) A 5-Day Board Plan (15 meals), Monday through Friday—holidays excluded. The fee for this plan is $440 per year and may be paid in two installments—one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

(2) A 7-Day Board Plan (21 meals), Monday through Sunday—holidays excluded. The fee for this plan is $550 per year and may be paid in two installments—one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

Both the 5- and 7-Day Board Plans will begin immediately following the student's obtaining a meal ticket and will end on the day which is scheduled for graduation. (5-Day Board Plan tickets will not be issued on Saturdays or Sundays.)

(3) Students who are not on a board plan may purchase tickets for individual meals at prevailing prices. Except on special occasions, a la carte service will not be offered in the student dining halls.

All students who enter the University for the first time from high school or preparatory school and who live in University residence halls are required to subscribe to either the 5- or 7-Day Board Plan. Either the 5- or the 7-Day Board Plan is also recommended to upperclassmen who reside in University residence halls.

Upperclassmen and graduate students have the option at the time of their enrollment of electing either the 5- or the 7-Day Board Plan provided they agree to pay the board-plan fee for the period of their enrollment during the academic year.

A student having selected a Board Plan for the academic year may not withdraw as long as he remains enrolled, except in the case of marriage or circumstances which are determined by the University to be beyond his control.

LAUNDRY–DRY CLEANING

A plant with modern equipment is conveniently located on campus to service the laundry and dry-cleaning requirements of the student. Reasonable prices are charged for individual items on a cash-and-carry basis.

The University will not be liable for lost or damaged items unless reported within two days after the delivery date, and then for not more than the actual depreciated value of such articles as have been lost or damaged.

Coin-operated washing machines and dryers are available in the laundry building and several of the dormitories.

A student linen-rental service is also available. Information regarding this service will be forwarded to all students who are accepted for enrollment in the University.

MEDICAL EXAMINATIONS

Completion of a medical history and physical examination record is required of all new students entering Clemson University for the first time. This examination must be completed by the student and the student's own physician or the health service of the school from which he graduates or transfers. This examination must be reported on a special form provided for this purpose by the University and mailed directly to the Director of Student Health Service. This should be received at least four weeks prior to matriculation to give time for processing; otherwise, registration may be delayed. Incomplete forms will be returned.

The University requires that all new students have a current tetanus toxoid series or booster (within five years), a smallpox vaccination (within four years) and also immunization against poliomyelitis. The oral (Sabin) type vaccine is preferred. All new students are also required to have a skin test for tuberculosis within one year prior to admission. If this test is positive, a chest X-ray is also required. All positive reactors will then be required to have an annual chest X-ray. These follow-up X-rays after admission will be done at the Student Health Service.

STUDENT HEALTH SERVICE

Student Health Service: Cost per Semester $35. Payment of the Student Health Service fee is required of all students living in University residence halls and all full-time students even though they do not reside in University housing. The Student Health Service is housed in the new Redfern Health Center and is complete with outpatient department and a 34-bed hospital. The staff consists of three full-time physicians, including the director, a psychiatrist, thirteen full-time registered nurses, a full-time registered laboratory technician, and a full-time registered X-ray technician. In addition, a sufficient number of nurses' aides, secretarial workers, orderlies and maids for 24-hour-a-day operations are employed. The best of modern equipment is available for student use.

The Student Health Service at Clemson University has several important functions. All of these are aimed at keeping the student in good health so that he may effectively pursue his school work. There is, of course, the basic function of medical care for the ill and injured. This is a vital part of its work. In addition to this, the Student Health Service attempts to put strong emphasis on health rather than illness. This begins with the entrance medical form. In laying out this form an attempt is made to get information, examinations and preventive medical procedures carried out to better equip the staff in protecting the student from illness and to serve as a guide for the care of preexisting medical problems.

As the student progresses through his academic experiences, other procedures may be required or highly recommended. These are primarily an effort to teach the individual self-responsibility for maintenance of his own health, protection of the health of those around him, and locate possible hidden diseases. The Health Service also has the position as the source of medical information as well as responsibility for indicated medical action: diagnostic, therapeutic, and preventive.

The medical fee paid by each student covers the services of the University physicians, the health service staff and equipment for most illnesses and injuries occurring on or around the campus. This coverage is given under conditions similar to that of one's own physician. There will be regular office hours plus the services of the nursing staff for minor ailments after hours. One physician is on call at night for emergencies whenever the school is open. The Health Service is closed between semesters.

There are certain things, however, that it does not include, such as fees for routine physical examinations for employment or transfer to another school, fees for outside physicians when called in for consultation, medical or surgical services performed away from the University, or for accidents occurring off the campus. The fee does cover medication for acute illness but not for chronic illness lasting over two weeks. Although ambulance transportation to a general hospital for serious illness or injury occurring on campus will, of course, be arranged, the expense for this service is the responsibility of the student. Transportation for less urgent ailments and routine visits can be arranged through the Health Service at the expense of the student. An emergency vehicle for local use is maintained by the Security Department.

The Student Government, with full approval of the administration, offers a plan of accident and sickness insurance to full-time students. Each year, prior to the beginning of the fall semester, complete information on this insurance plan will be sent to students. This insurance is inexpensive and is designed to cover major medical expense not covered by the Health Service. It is highly recommended.

UNDERGRADUATE FINANCIAL AID

The Office of Student Financial Aid, operating in conjunction with the University Honors and Awards Committee, is responsible for coordinating all types of financial assistance administered by the University. Currently available financial aids consist of scholarships, student loans, grants, and part-time employment. Sufficient aid is programmed to meet the requirements of all students meeting the criteria of financial need as determined by College Scholarship Service and academic ability/potential as evidenced by achievement at Clemson or, for entering students, high school records and College Entrance Examination Board Scholastic Aptitude Test scores.

CUTOFF DATES FOR RECEIPT OF APPLICATIONS ARE FEBRUARY 1 FOR GRANTS AND SCHOLARSHIPS AND JUNE 1 FOR LOANS.

A brochure describing financial aid programs and procedures for making application may be obtained by writing to the Office of Student Financial Aid, Clemson University.

HONORS AND AWARDS

The University offers a number of awards for outstanding achievement in specific fields and endeavors. Recipients are chosen by selection committees and are announced at the annual Honors and Awards Day program or other appropriate ceremonies. Detailed information relating to such awards is available in the offices of the academic deans and department heads.

GUIDANCE SERVICES

Guidance has an important role at all levels of education and particularly so during times of transition and articulation. To assist students in this period of emotional and academic adjustment, an orientation and counseling program has been established.

At the beginning of his university career, each student is assigned to a faculty adviser selected from his academic school. The faculty advisers provide information on courses of study, approve class schedules, interpret academic regulations, and suggest adjustments in making satisfactory progress toward graduation.

The residence hall program is organized to cope with personal problems and questions regarding procedures and policies of college life. Residence hall counselors and supervisors are primarily concerned with maintaining an environment compatible to serious study and with the educational potential of group living.

COUNSELING SERVICES

Counseling Services are located in Tillman Hall. These services are available free of charge to all registered students and spouses of registered students. These services are oriented to early identification of and assistance with academic, vocational, personal, and psychological problems. Testing facilities of a vocational and psychological nature are available. Students are encouraged to take advantage of the individual services of a counseling psychologist, a counselor, and of the Psychometric Services.

The service is dedicated to helping students in self-understanding, self-improvement, and in the attaining of academic and vocational goals. The aims of the service are preventive rather than curative.

PLACEMENT SERVICES

The University is glad to assist all who ask for help in securing summer or permanent employment; it does not assure positions for those who complete any of the courses of study.

The Placement Office coordinates and plans campus interview visits requested by representatives seeking graduates for positions with business, industry, and public service. It maintains current files of reported job opportunities and of alumni who wish to learn of available openings.

A Placement Bulletin is prepared periodically for distribution on the campus and for mailing to alumni upon request. It announces scheduled campus interviews and lists specific openings which may be of interest to students and alumni.

BUILDINGS AND GROUNDS

Change, challenge, and continuity are embodied in the architecture and landscape of Clemson University. The campus skyline is constantly changing, reflecting the new demands of the institution as it moves into the decade of the 70's and beyond.

While the challenges of the future—solving problems like environmental pollution—are symbolized by such buildings as the impressive new $2.4 million Rhodes Engineering Research Center (dedicated primarily to environmental and biomedical research), Clemson's long, rich tradition of education, scientific research, and public service is brought to mind by historic structures like the Tillman Hall tower, focal point of the campus, whose cornerstone was laid in 1891.

The campus proper consists of 600 acres and represents an investment of approximately $70 million in academic buildings, student housing, service facilities and equipment. Basically, this is the site of Thomas Green Clemson's plantation, willed to South Carolina in 1888 for the establishment of the University. Fort Hill, former home of both Mr. Clemson and his father-in-law, John C. Calhoun, has been preserved at the center of the campus as a national shrine.

Beyond the main campus, stretching into Oconee, Pickens, and Anderson counties, are another 24,000 acres of farm and agricultural and forestry research lands. Throughout the state are 6,800 more acres devoted to Agricultural Experiment Station research and 4-H Club activities.

The University's $60 million building program to meet projected needs of a 10,000 student body by 1975 is over 25 percent complete.

More than $32 million in new construction was added to the campus during the decade of the sixties.

One of the central features of campus development, the Robert Muldrow Cooper Library, was completed in 1966. This beautiful structure houses some 453,000 volumes and is the permanent home of papers and souvenirs belonging to both the Honorable James F. Byrnes and State Senator Edgar A. Brown, as well as valuable collections of papers and letters of John C. Calhoun and other famous South Carolina statesmen.

Other new facilities completed under the current building program are three high-rise residence halls which currently hold 1,296 students, a 34-bed hospital and out-patient clinic, an east campus cafeteria, an arts and sciences classroom building and 10-story faculty office tower, and the multi-purpose J. C. Littlejohn Coliseum, which seats 10,500 people for basketball games and 12,000 for speaking engagements, concerts and other functions.

Teaching and laboratory facilities of the College of Agricultural Sciences are housed in the R. F. Poole Agricultural Center complex. Another grouping serves the College of Engineering, including Olin Hall for Ceramic Engineering and Earle Hall for Chemical Engineering. These two buildings and their excellent equipment represent gifts from the Olin Foundation totaling nearly two million dollars.

Sirrine Hall is the home of the College of Industrial Management and Textile Science, where government and industrial cotton fiber testing laboratories are located. The College of Architecture is located in the modern, well-equipped Lee Hall. Other groupings of classrooms and laboratories serve the College of Education, the College of Liberal Arts, the College of Physical, Mathematical, and Biological Sciences, and the College of Nursing.

The current building program includes plans for construction of a $6 million University union and related facilities, a new building to house agricultural administration and the recently established College of Forest and Recreation Resources, a biological sciences building, and a $2.1 million addition to the College of Architecture.

The University's sixteen residence halls for men and women accommodate nearly 5,200 students. One hundred and fifty individual units and apartments provide living accommodations for another 289 married students.

Ten of the residence halls, with 2,244 students, are fully carpeted; there are telephones in 1,405 student rooms.

The University-owned Clemson House Hotel, with its 184 rooms and apartments, together with 112 faculty and staff housing units provides excellent community hotel facilities and permanent housing.

RESERVE OFFICERS' TRAINING CORPS (ROTC)

The Department of the Army and the Department of the Air Force both maintain ROTC units at Clemson University. The mission of the Reserve Officers' Training Corps is to produce officers having qualities of leadership and attributes essential to their progress and continued development as commissioned officers in either the Army or the Air Force of the United States. A four-year program, consisting of the basic course for freshmen and sophomores and the advanced courses for juniors and seniors, is offered by both services.

To enroll in basic ROTC, students must be at least 14 years of age and citizens of the United States at the time of entrance. They must be of good moral character and must sign a loyalty certificate. They must not be physically disqualified to the extent that drill would further aggravate the physical defect. Air Force candidates will be administered a written Air Force Officer Qualification Test and a physical examination during their freshman or sophomore year to determine eligibility for the advanced AFROTC course, and interested Army candidates will be administered a written Army Officer Qualification Test and a physical examination during their sophomore year to determine eligibility for advanced Army ROTC. Foreign students may enroll in the ROTC program provided they sign a statement of intention to become American citizens or receive the approval of their government.

Students enrolled in the advanced course are paid $100 per month, including one summer vacation. Pay while attending summer camp is computed differently and is considerably higher. Members of the advanced course are required to attend one summer camp before commissioning.

Students who have six months or more active military service and students who have successfully completed two or more years of ROTC training at the high school level may substitute such service and preparatory schooling for all or part of the Clemson basic ROTC course. Students in either of these categories should consult with the Head of the Military Science or Aerospace Studies Department concerning accreditation.

Students who complete the prescribed ROTC courses and receive a bachelor's degree will be awarded commissions in the Army or Air Force. Students who complete the basic course may receive 4 semester credit hours of elective credit; those selected for Advanced ROTC may substitute Aerospace Studies or Military Science courses for an additional 6 semester hours' credit.

Uniforms are provided to ROTC students. The University requires a deposit of $25 from each basic student. This is refundable when the uniform is turned in, provided there is no damage to the uniform other than normal wear. Each advanced ROTC student is credited with a uniform allowance, paid by the Government to the University, which is used by the University to purchase officer-type uniforms for use during the junior and senior years. The uniform becomes the property of the student when he is commissioned.

AIR FORCE ROTC

The Air Force ROTC program provides for selected students an education vital to the career of a professional Air Force officer. Commissions in the United States Air Force are awarded to male and female students who qualify for enrollment and successfully complete the program.

The four-year program consists of the General Military Course (GMC) or basic course and the Professional Officer Course (POC). During the second year of the GMC, a cadet may apply for admission into the POC.

Cadets who enter in the POC under the four-year program attend a four-week training period at an Air Force base during the summer following their sophomore year. This provides an exposure to an Air Force environment which is beneficial in preparing cadets for future management positions.

The two-year program consists of a six-week preparatory training period at an Air Force base during the summer between the student's sophomore and junior years, and the POC. The six-week preparatory training replaces the GMC and the four-week field training period. Applicants for the two-year program must meet all eligibility requirements for POC enrollment.

To be eligible for enrollment in the POC a cadet must: (1) make application; (2) pass the Air Force Officer's Qualification Test; (3) pass the Air Force physical examination; (4) meet citizenship, age, and loyalty requirements; (5) possess leadership ability and good moral character; (6) successfully complete two academic years of the GMC or have received credit for its equivalent; (7) enlist in the Air Force Reserve (Obligated Reserve Section); (8) have two academic years remaining (including graduate study) at Clemson University at the time of entrance; (9) be enrolled as a full-time student; (10) have attained the academic standards required by the University and the Air Force; (11) be selected by a board of Air Force officers.

Most male POC cadets are expected to become Air Force flying officers. Entry into the POC for nonflying candidates is on an extremely competitive basis.

Male POC cadets who intend to become Air Force pilots participate in the Flight Instruction Program (FIP) during their senior year. They receive, at Government expense, pilot training conducted by a civilian contract flying school. Students who are not qualified or do not desire pilot training may be considered for entry into the POC as candidates for navigator training or officer duty in nonflying categories.

AFROTC provides scholarships to highly qualified AFROTC cadets each year. Each scholarship pays tuition, fees, and $75 per academic year for books, in addition to $100 per month to the recipient.

The Air Force offers outstanding opportunities for an AFROTC graduate to pursue studies leading to an advanced degree. The educational delay program allows an AFROTC graduate to have his call to active duty delayed until he receives his advanced degree.

The Air Force Institute of Technology (AFIT) offers graduate programs in scientific, technical, and other professional fields. These programs are conducted at the AFIT resident school, Wright Patterson AFB, Ohio, at selected civilian institutions, and through training-with-industries programs. AFROTC graduates are eligible to apply for AFIT schooling after they are called to active duty. Air Force officers receive full pay and allowances while attending school under the AFIT program.

ARMY ROTC

The Army ROTC instruction stresses an academic college-level program in content, scope, and intensity. Emphasis is placed on the development of the student's leadership, bearing, discipline, judgment and sportsmanship which will be a distinct asset in any profession that he may choose, military or civilian.

The General Military Science Program is conducted at Clemson (See Part V of this catalog for a description of courses). The program consists of a Basic course for freshmen and sophomores and the Advanced program for juniors and seniors. A student who has successfully completed the Basic course, who meets the physical requirements, who has earned sufficient academic credits to be designated as an academic junior, and who is recommended by his instructors, may enter the Advanced course offered during the junior and senior years. Successful completion of the Advanced program qualifies the student for a regular or reserve commission.

Scholarship Program. Scholarships are available to selected ROTC students who are strongly motivated toward a career in the Army. Each scholarship pays for tuition, books and laboratory expenses, and, in addition, pays $100 a month for the duration of the award, except during the Advanced course summer training camp at the end of the junior year when the pay is at the rate of one-half the base pay of a second lieutenant with two or less years of service per month. Only students who participate in the four-year program are eligible. For further information concerning the scholarship program, contact the Office of the Professor of Military Science.

The requirements for formal enrollment in the Advanced ROTC Program are as follows:

Junior Year. Must have successfully completed all previous Military Science courses, have acquired a passing grade on a general intelligence test which is administered during the sophomore year, be physically qualified, and must have acquired the credits, a grade-point ratio of 2.0 and be designated an academic junior. The number of credits required for participation in the Advanced course complements the academic requirements of the University and insures that the cadet receives his commission and his diploma simultaneously.

Senior Year. Must have successfully completed all previous Military Science courses and have attended summer camp, must be an academic senior, and have the cumulative grade-point ratio required for graduation.

Exceptions, where warranted, to the above general rules may be made by the Head of the Military Science Department.

During the four years of general military instruction, students will have the opportunity to indicate their preference for assignment to a particular branch. Final assignment authority remains with the Department of the Army and will be dependent upon such factors as the student's major academic course, class standing, qualities of leadership, the requirements and existing vacancies in the various branches of the Army, in addition to the student's choice.

Outstanding Army ROTC cadets who attain grades in the upper half of the class in academic subjects and the upper third in Military Science subjects during their junior year and who possess outstanding qualities of leadership, character, and aptitude for military service may, with the approval of the University President, be designated as Distinguished Military Students by the Head of the Military Science Department. Those who maintain this outstanding record during their senior year may be designated Distinguished Military Graduates. A Distinguished Military Student may apply for appointment as a Second Lieutenant in the Regular Army.

Flight Training Program. An Army ROTC student in his fourth year of Military Science, or having completed his fourth year of Military Science, but not completed his academic requirements for graduation, may enroll in the Army ROTC Flight Training Program. If accepted, the student will receive 35 hours of ground school and 36½ hours of flight training at Government expense, after which the student may qualify for his FAA license and be recommended for further flight training upon entry on active duty. To be accepted in the Flight Training Program the candidate must agree that if commissioned at time of graduation, he will volunteer for Army Aviation Flight Training and assignment, and to serve on active duty as a commissioned officer for not less than three consecutive years from the date of completion of the Army Aviation Flight Training Course, in addition to meeting other physical and mental requirements.

ROTC students receiving commissions in the Regular Army or Army Reserve have the opportunity to apply for graduate school. If accepted by the Army, the applicant may be allowed to delay entry upon active duty to complete graduate study.

The student who receives his commission through Army ROTC is appointed in the Army Reserve as a Second Lieutenant and called to active duty for two years. Graduates of the program who enter active duty for two years will acquire a six-year military obligation, only three of which would be in the Ready Reserve.

A recapitulation of Army service obligation is listed below:

	Reserve Officers	*Regular Army*	*Reserve Flight Training Officers*
Active Duty	2 years	3 years	4 years (Approx.)
Ready Reserve	3 years	2 years	0 years
Standby Reserve	1 year	1 year	2 years

ROTC Requirement. For those students who matriculate initially at Clemson after the spring semester 1970, ROTC will no longer be a requirement for graduation. In order to resolve the requirements and status of students matriculating prior to the end of the spring semester 1970, the following requirements apply:

To be eligible for graduation all male students not otherwise exempted whose initial matriculation in Clemson University was:

(1) On or before August 29, 1968, must complete four semesters of ROTC courses.

(2) After August 29, 1968, but prior to January 17, 1969, must complete three semesters of ROTC courses.

(3) After January 16, 1969, but prior to January 5, 1970, must complete two semesters of ROTC courses.

(4) After January 4, 1970, but prior to May 9, 1970, must complete one semester of an ROTC course.

(5) After May 9, 1970, ROTC courses are not a requirement for graduation.

HISTORICAL STATEMENT

It was the fall of the year and likely one of those blustery days as the horsedrawn carriage slowly rolled to a stop on a Pendleton road in 1886.

The driver, a tall, distinguished-looking man in his late seventies, peered from the carriage as if looking for someone he knew. Soon, another aged man approached the carriage, exchanged greetings with the first, and the two men—Thomas Green Clemson and Senator Benjamin Ryan Tillman—drove away together toward historic Fort Hill, a plantation some four miles away and the former homestead of John C. Calhoun, Clemson's late father-in-law.

Mr. Clemson had invited Senator Tillman to his home to discuss their mutual conviction that South Carolina needed a separate college devoted to industrial and scientific education. At Fort Hill, they met with Col. D. K. Norris and Col. R. W. Simpson. There the four "spent nearly the whole day in talking over the new project which Mr. Clemson had in mind and which he unfolded to us," Tillman later wrote.

Perhaps the most significant result of this conference was Mr. Clemson's decision to change a will he had made three years earlier and to execute a new will so as to serve better the great purpose which he had had in mind for many years.

Although his will of 1883 sought to provide for establishment of a scientific institution upon the Fort Hill place, Mr. Clemson later decided that his intention and purpose as stated in that will may be misunderstood.

In his new will, executed November 6, 1886, Mr. Clemson wrote that he desired to make his purpose plain and to make some other changes in the disposition of his property. He clearly explained the nature and purpose of his proposed institution, the establishment of which "is now the one great desire of my life."

"It should afford thorough instruction in agriculture and the natural sciences connected therewith; it should combine, if practicable, physical and intellectual education, and should be a high seminary of learning in which the graduate of the common schools can commence, pursue and finish the course of studies terminating in thorough, theoretic and practical instruction . . ."

The first item of the new will concerned disposition of the 814 acres of the Fort Hill place and was largely taken from the 1883 will.

The will gave to the state all that part of the Fort Hill Estate inherited by Mrs. Clemson (the former Anna Maria Calhoun who died in 1875, thirteen years before her husband) from her mother and the bulk of Mr. Clemson's other real and personal property. The latter amounted to a sum which, considering the purchasing power at the time, probably has been only a few times exceeded in a public benefaction in South Carolina.

Mr. Clemson's will also provided for a seven-member Board of Trustees that would govern and manage the new institution. Named were: Cols. Simpson and Norris, M. L. Donaldson, R. E. Bowen, B. R. Tillman, J. E. Wannamaker, and J. E. Bradley, who with those chosen by the General Assembly, would constitute a governing board if the state accepted the bequest; but, who, in the event the state declined the bequest, would alone constitute a governing board for a private institution.

These seven trustees, along with other friends of the movement and the agricultural groups in the state, developed and organized a public opinion favorable to the plan.

In November, 1889, the South Carolina General Assembly accepted the terms of Mr. Clemson's will and following the decision of the U. S. Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas G. Clemson into the reality of Clemson College.

The institution formally opened in July, 1893, with an enrollment of 446 students. The first graduating exercises were held in December, 1896, with a graduating class of 37—15 in the agricultural courses and 22 in engineering courses.

The college was also established under the Morrill Land-Grant Act passed by the National Congress in 1862. Clemson University, therefore, is a member of the national system of Land-Grant Colleges and Universities.

In 1964, in recognition of expanded offerings of the institution not only in the areas of agricultural and mechanical arts but also in the sciences and arts, the name of the institution was changed to Clemson University. This change by the legislature, effective July 1, 1964, followed a recommendation to that body by the Board of Trustees.

LOCATION

The University is located on the Fort Hill homestead of John C. Calhoun, in the foothills of the Blue Ridge Mountains. It has an elevation of 800 feet above sea level and commands an excellent view of the mountains to the north and west, some of which attain an altitude of over 5000 feet.

The University is located at Clemson, South Carolina, on the main line of the Southern Railway. U.S. Highways numbers 76 and 123 pass through Clemson, and daily bus service at regular intervals is available..

ALUMNI RELATIONS

The office of Alumni Relations coordinates all functions and services of the Alumni Office. The director of alumni relations is secretary of the Clemson Alumni Association and the Clemson Foundation through election by the governing boards of these two organizations.

Accurate records of addresses and information concerning alumni are being compiled by this office which also publishes a magazine and newsletter for distribution to the alumni.

The purpose of the Alumni Association is to serve the University and its alumni in every possible way. The Association holds its regular annual meeting at the University each June. Active membership is made up of former Clemson students who participate in the Clemson Alumni Loyalty Fund for the purpose of providing supplementary financial aid to the educational programs of the University.

The Clemson University Foundation was founded by interested members of the Alumni Association to raise an endowment to be used for the benefit of the University, its students, faculty, and alumni. Trustees of the Foundation are elected by the Association.

THE J. E. SIRRINE TEXTILE FOUNDATION

Funds in this foundation were contributed by the members of the textile industry in South Carolina. Income from this fund is administered by the trustees of the J. E. Sirrine Textile Foundation. They have used the income to benefit textile teaching and research at Clemson University. Under the present system it is used to (1) supplement University travel funds for faculty members, (2) sponsor the college library, (3) provide supplement to the salaries for two major professors, (4) provide two undergraduate scholarships and five graduate fellowships annually, one of which may be held by a faculty member, (5) sponsor annual seminars for South Carolina high school counselors, (6) support special research projects, and (7) sponsor the Clemson University Review of Industrial Management and Textile Science—a professional journal.

PART III

STUDENT LIFE AND ACTIVITIES

PART III—Student Life and Activities

STUDENT BODY

The students of Clemson University believe that student government is necessary and beneficial and that every student should be represented in this government. All registered undergraduate and graduate students are, upon payment of the Student Activities Fee, members of the Student Body of Clemson University which in turn is represented by the student government.

Student government is actively sponsored and highly effective at Clemson. The three branches of government are patterned after our federal system; however, there are no political parties within the framework of this student organization. February and March are election months for student body officers. Elections for Student Senators are held in September. Students interested in self-government are encouraged to participate in this active student organization.

STUDENT PUBLICATIONS

The *Chronicle* is a student variety magazine published four times a year.

The *Taps* is the yearbook published by the students of the University.

The Tiger is a weekly paper published by the students of the University.

THE STUDENT CENTER

The student center, located in Johnstone Hall, has a student lounge with space for reading and television. On the third floor there are meeting rooms and the student chapel. Also in this area are the offices of student publications, such as *The Tiger,* student newspaper; the *Taps,* annual publication; and Radio Station WSBF. The visitors' lounge and the information center are on the first floor off the loggia. The bookstore, post office, and canteen are located on the levels below the loggia.

CULTURAL, MUSICAL, THEATRICAL ACTIVITIES

University Concert Series

Each year since 1940 Clemson University has sponsored a concert series. All Clemson students paying full-time student activities fees are admitted to these concerts without charge. Others, including faculty members, may purchase tickets at a moderate cost.

The Program of Concerts for 1972-73 is:

Itzhak Perlman, Violinist	September 25, 1972
The Gregg Smith Singers	November 14, 1972
"Heavy Organ," with Virgil Fox and Pablo's Lights	February 19, 1973
Les Ballets Africains	March 8, 1973
Houston Symphony Orchestra, Lawrence Foster Conducting, with Piano Soloist Horacio Gutierrez	March 13, 1973

Architectural Foundation Lectures and Exhibits

The College of Architecture at Clemson is able to present annually an outstanding series of lectures, which are open to all Clemson students, through financial grants from the Clemson Architectural Foundation. The Foundation also presents an annual schedule of at least twelve art exhibits in the Architectural College gallery, which is open to the public weekdays between 9 a. m. and 4:30 p. m.

University Bands

Tiger Band. The Tiger Band and Color Guard, composed of approximately 120 members, participate in football games, pep rallies, functions, and parades throughout the South. This band has appeared in major stadiums in many states, including the Gator, Orange, Sugar, and Bluebonnet Bowls and has performed on national television. The Tiger Band makes several out-of-town trips during the fall season. A smaller "pep band" from its ranks performs at all home basketball games.

Concert Band. The Clemson Concert Band is composed of the better musicians on campus. It is formed at the end of the football season, and gives concerts both on and off the campus, including a tour in the spring. This organization plays music of the great composers in addition to lighter fare.

University Chorus. The University Chorus comprises some eighty students who perform a wide variety of choral music in concerts presented on campus and on an annual spring concert tour. An audition is required for new members, with prime consideration given to singing ability and balance of voices.

Clemson Players. This is the dramatic club of the University and is open to all students interested in dramatics. Four productions are presented annually.

UNIVERSITY UNION PROGRAMS

The purpose of the University Union on the campus is to serve the social, cultural, recreational, and spiritual needs of students. The University Union Governing Board, consisting of students, faculty, and alumni as well as the University Union Staff, has the responsibility of planning and administering Union programs. Programs already underway are the coffee house, small concerts and jam sessions, Scuba Club, karate, and tutoring programs. Many others are in the planning phase.

The University Union is divided into five departments—the University Union building, the Holtzendorff YMCA Center, Foreign Student Affairs, Religious Affairs, and Community Services.

Union Building Activities

Activities planned in the Union building will include lounges, TV room, billiards, bowling, coffee house, meeting rooms and club offices. A comprehensive social, recreational, and cultural program will be offered.

Holtzendorff YMCA

The "Y" is another area set aside for Union programs and includes a Health Club, game room, theatre, meeting rooms, coffee house, and other facilities. A major share of Union programming at the YMCA Center are activity groups such as karate, scuba diving, lifesaving, exercise groups, and interest groups.

Religious Affairs

Religious life on the campus is coordinated by the Union Director in cooperation with local University ministers and clergymen. The YMCA building provides a place for denominational groups not having a church at Clemson, as well as for many interdenominational groups. The Student Center in Johnstone Hall also contains a Student Chapel which is available for use on a regularly scheduled basis.

Student religious organizations at Clemson offer students an opportunity to grow spiritually and socially. These organizations are:

Agape
Baptist Student Union
Christian Science Organization
Campus Crusade for Christ
Episcopal Student Association

Hillel-Brandeis (Jewish)
Lutheran Student Association
Newman Student Association (Catholic)
The Navigators
Wesley Foundation (Methodist)
Westminster Fellowship (Presbyterian)

Foreign Student Affairs

More than 100 foreign students are enrolled at Clemson, and the University feels strongly that special emphasis should be placed on work with these students. The associate director of the YMCA is director of Foreign Student Affairs and gives guidance to its program of education, social life, personal counseling, and legal affairs.

Community Services

Many students at Clemson are concerned not only about fellow students but also about persons in the Clemson community and surrounding area. This concern becomes involvement and action as students go out into the community to serve as volunteer coaches, tutors, friends, counselors, candy stripers, helpers in day care centers, children's homes, and in other different ways. The purpose of the Community Services program is to coordinate these efforts and services to better serve the campus and community.

The general purpose of the overall campus Union program is to serve student needs and interests, and the Union will continually seek to provide these opportunities for students on the Clemson University campus.

CAMPUS LEADERSHIP AND SERVICE

Block "C" Club—The Block "C" Club includes varsity lettermen in baseball, basketball, football, track, cheerleading, swimming, fencing, and soccer.

Tiger Brotherhood—A local honorary service fraternity composed of men students from the upper three classes who have demonstrated ability, character and loyalty to Clemson University.

Circle"K" International—International Service Club for college men sponsored by Kiwanis International.

Central Dance Association—The C.D.A. staff is responsible for planning and coordinating major dance weekends at which time name entertainment is brought to the campus.

WSBF—WSBF is an educational radio station managed, maintained, and operated by a student staff for the enjoyment of the Clemson student body and the surrounding academic community. The station broadcasts 24 hours a day on both open circuit FM and closed circuit AM from a modern studio in the University Student Center.

Order of Athena—A local honorary society for senior women who have maintained a high standard of scholarship, demonstrated leadership, and shown a spirit of service to the University.

NATIONAL HONOR SOCIETIES

Clemson University has chapters of the following members of the Association of College Honor Societies:

Alpha Epsilon Delta (Pre-medical—Men and Women)
Alpha Lambda Delta (Scholarship—Freshman Women)
Delta Sigma Rho–Tau Kappa Alpha (Forensics)
Phi Eta Sigma (Scholarship—Freshman Men)
Phi Kappa Phi (Scholarship—Senior Men and Women)
Tau Beta Pi (Engineering—Men and Women)
Tau Sigma Delta (Architecture and Allied Arts—Men and Women)

Other Honor Societies:

Sigma Xi (Scientific Research—Men and Women)
Xi Sigma Pi (Forestry—Men and Women)

NATIONAL RECOGNITION SOCIETIES

The following national recognition societies have chapters established at Clemson:

Alpha Phi Omega (Campus Service—Men)
Alpha Zeta (Agriculture)
Angel Flight (Air Force—Women)
Arnold Air Society (Air Force—Men)
Block and Bridle Club (Animal Science)
Blue Key (Scholarship, Leadership, Service—Men)
Iota Lambda Sigma (Industrial Education)
Pershing Rifles—Company C-4 (Military)
Pershing Rifles—4th Regimental Headquarters
Scabbard and Blade—Company K-7 (Military)

DEPARTMENT AND PROFESSIONAL ORGANIZATIONS

Agricultural Sciences Council
Agronomy Club (Kappa Alpha Sigma)
Alpha Tau Alpha (Agricultural Education)
American Agricultural Economics Association
American Association of Textile Chemists and Colorists
American Association for Textile Technology
American Ceramic Society
American Chemical Society
American Institute of Aeronautics and Astronautics
American Institute of Architects
American Institute of Chemical Engineers
American Society of Agricultural Engineers
American Society of Civil Engineers
American Society of Horticultural Science
American Society of Mechanical Engineers
American Society for Metals
American Society for Microbiology
Associated General Contractors of America, Inc.
Botany Club
Calhoun Forensic Society
Calhoun Literary Workshop
Capers (Co-ed Pershing Rifles)
Counter Guerrilla Platoon
Dairy Science Club
Delta Sigma Nu (Pre-med)
Food Science Club
Forestry Club
French Club
Future Military Wives Club
Gamma Alpha Mu (English)
Graphic Arts Society
Institute of Electronic and Electrical Engineers
Iota Mu Sigma (Industrial Management)
Keramos (Ceramics)
Light Brigade (Army—Women)
McConnell Society (German)
Medical Technology Organization
Microbiology Society

Mu Beta Psi (Music)
Newtonian Society (Mathematics)
Omicron Delta Epsilon (Agricultural Economics and Economics)
Outing Club
Phi Delta Chi
Phi Psi (Textile Arts)
Photography Club
Poultry Science Club
Pre-veterinary Club
Psi Mu Psi (Music—Women)
Recreation and Parks Administration Club
Sigma Pi Sigma (Physics)
Sigma Tau Epsilon (Arts and Sciences)
Society for the Advancement of Agricultural Education
Society for Advancement of Management
Society for American Military Engineers
Society of Physics Students
Society for Technical Operations
Student Education Association
Student Nurses Association
Zoology Club

GENERAL ORGANIZATIONS

Aero Club
Amateur Radio Club
Bowling Team
Campus Crusade for Christ
Carolina Sound Express
Dixie Skydivers Sport Parachute Club, Inc.
Fellowship of Christian Athletes
Fine Arts Film Club
Four-H Club
Girls' Service Sorority
Kappa Alpha Sigma
Periaktoi
Phi Alpha Zeta
Rifle Club
Sailing Club
Skin and Scuba Diving Club
Sentimental Jazzmen (Music)

Sigma Psi Nu (Swimming)
Soccer Booster Club
Student League for Black Identity
Student Organizing Committee
Students for Educational Aid
Survival
Tae Kwon Do Club (Karate)
University Democrats Club
University Political Caucus
University Republican Club
Weightlifting Club
Women's Fencing Club

SOCIAL FRATERNITIES AND SORORITIES

Fraternities

Alpha Gamma Rho (Colony)
Alpha Tau Omega
Beta Theta Pi
Chi Psi
Kappa Alpha
Kappa Sigma
Phi Delta Theta
Phi Gamma Delta (Colony)
Pi Kappa Alpha
Sigma Alpha Epsilon
Sigma Nu
Sigma Phi Epsilon
Theta Chi

The Interfraternity Council serves as the coordinating and governing body of the social fraternities.

Sororities

Chi Omega
Delta Delta Delta
Kappa Alpha Theta (Colony)
Kappa Kappa Gamma

The Panhellenic Council coordinates the activities of the social sororities.

REGIONAL CLUBS

The regional clubs of Clemson University are composed of international clubs, out-of-state clubs and clubs representing the various counties in the state. The regional clubs are made up of students who wish to unite with other students from their own home areas. These clubs include:

Chinese Students
India Association
International Student Association
Kappa Delta Kappa (Dillon County)
Colleton County Club
Pi Kappa Rho (Pickens County)

ATHLETIC PROGRAM

The University encourages students' interests in sports through a program of intercollegiate athletics and intramural sports.

It is a member of the Atlantic Coast Conference and its athletic teams, The Tigers, regularly play teams of that conference and other colleges. Membership of the Atlantic Coast Conference includes—in addition to Clemson University—Duke University, North Carolina State University, University of Maryland, University of North Carolina, University of Virginia, and Wake Forest University.

The intercollegiate athletic program includes football, basketball, baseball, track, tennis, golf, swimming, cross-country, soccer, and fencing. Each year over 200 teams are formed in softball, football, volleyball and basketball in the intramural program, with champions determined in each sport through a tournament.

Among the facilities for intramural and intercollegiate athletics at the University are tennis courts, baseball and track facilities, an indoor swimming pool, and a football stadium which will accommodate almost 50,000 people. The Littlejohn Coliseum, with a seating capacity of approximately 10,000 for basketball and up to 12,000 for other events, was completed in 1968. The Fike Fieldhouse is being renovated to accommodate intramural activities.

AUTOMOBILE PRIVILEGES AND PARKING REGULATIONS

All motor vehicles owned and operated on the campus by students, faculty, and staff members must be registered with the designated authorities. On registering, each student, faculty, or staff member will be offered a copy of the parking and traffic regulations and will be issued a decal which will indicate the areas in which the car may be parked.

Students are urged to familiarize themselves with all provisions of the Traffic Code contained in the *Student Handbook of Clemson University*.

PART IV

SCHOLASTIC REGULATIONS

PART IV—Scholastic Regulations

SCHOLASTIC REGULATIONS

Academic Standards. Proper discharge of all duties is required at Clemson University, and a student's first duty is his scholastic work. All students should be thoroughly acquainted with and cognizant of these basic requirements.

The Credit System. The semester hour is the basis of all credits. Generally, one recitation hour or three laboratory or shop hours a week for a semester constitute a semester hour. Thus, in Engl 101, English Composition, 3 cr. (3,0), as you will find this subject listed in the Degrees and Curriculums, the student takes three semester hours. When he completes this course satisfactorily, he is granted three semester credit hours on his record. The notation "3 cr. (3,0)" means that the course carries three credits, has three clock hours of theory or recitation per week, and no laboratory hours. Ch 101, General Chemistry, 4 cr. (3,3), carries four semester hours, has three hours of theory, and a three-hour laboratory period.

Semester Grades. The standing of a student in his work at the end of a semester is based upon daily classwork, tests or other work, and the final examinations. Faculty members may excuse from the final examinations all students having the grade of A on the work of the course prior to the final examination, but for all other students written examinations are required in all subjects at the end of each semester, except in certain laboratory or practical courses in which final examinations are not deemed necessary by the department faculty.

Scholastic reports are mailed to parents four times each year, including a preliminary statement of progress near the middle of each semester, and a final report at the end of each semester.

The Grading System. The grading system is as follows:

A—*Excellent.* Indicates that the student is doing work of a very high character. The highest grade given.

B—*Good.* Indicates work that is definitely above average, though not of the highest quality.

C—*Fair.* Indicates work of average or medium character.

D—*Pass.* Indicates work below average and unsatisfactory. The lowest passing grade.

F—*Failed.* Indicates that a student knows so little of the subject that it must be repeated in order that credit may be received.

I—*Incomplete Work.* Indicates that a relatively small part of the semester's work remains undone. Grade I is not given a student who has made a grade F on his daily work. Students are allowed thirty days after the beginning of the next semester in which the student is enrolled to remove the incomplete grades unless (1) an extension of time is approved by the instructor concerned, or (2) within one year of residence after receiving such a grade, a student repeats the conditional course satisfactorily at Clemson, in which case no credit hours taken shall be recorded for the grade of I. A student who elects to repeat an incomplete course is responsible for notifying the Office of Admissions and Registration of his election during the semester in which the course is taken. This regulation applies only to the first time that a course is repeated.

In order to make up incomplete work, the student must first obtain a permit card from the Office of Admissions and Registration. This card serves as the authority for the removal of the I and also as a form for reporting the final grade.

WP—*Withdrew Passing.* This grade indicates that the student withdrew from the course while doing satisfactory work. No credit hours taken are recorded for the grade of WP provided that the course is dropped prior to the last three weeks of classes in the semester. Only semester grades shall be given and recorded for courses dropped during the last three weeks.

WF—*Withdrew Failing.* Indicates that the student withdrew from the course while doing unsatisfactory work. The credit hours of a subject on which the grade of WF is received are counted as credits taken in computing the student's grade-point ratio.

Pass-Fail Option. Juniors or seniors enrolled in a four-year curriculum may take four courses (maximum of 14 credit hours), with not more than two courses in a given semester on a pass-fail basis. Transfer and five-year program students may take pass-fail courses on a pro rata basis.

Required courses, courses in the major field, or courses that are needed to fulfill departmental requirements may not be taken pass-fail.

Letter graded courses which have been failed may not be repeated pass-fail.

Honors Program may exercise an option as to acceptance of pass-fail grading for Honors courses.

Registration in pass-fail courses will be handled in the same manner as for regular enrollment. Departmental approval must be obtained via Approval Form and returned to the Registrar's Office in accordance with the University Calendar for adding courses.

Instructors will submit letter grades to the Office of Admissions and Registration. These grades will then be converted as follows: A, B, C to P (pass); D, F to F (fail). Only P (minimum letter grade of C), or F will be shown on a student's permanent record, and will not affect the grade-point ratio.

If a student changes to a major which requires a previously passed course, and this course has been taken pass-fail, he may request (a) to take the course on a letter-graded basis, (b) "pass" be changed to "C," (c) substitution of another course.

In the event limited enrollment in a class is necessary, priority will be given as follows: (a) majors, (b) letter-graded students, (c) pass-fail students, and (d) auditors.

Dropping Classwork. A subject dropped after the first four weeks of classwork is recorded as "Withdrew Passing" or "Withdrew Failing" depending upon the student's grade in the course at the time the subject was dropped.

Upon the recommendation of the instructor and the dean concerned, a student's standing will be investigated and he may be required to drop a subject because of neglect, or lack of application or preparation. No student will be dropped under this rule without approval of the President.

Removal of Failures. A student who has failed (made a grade F) in a subject cannot receive credit for that subject until it has been satisfactorily repeated hour for hour in class, except that in the case of correlated laboratory work, the number of hours to be taken shall be determined by the instructor. Where separate grades for class and laboratory work are given, that part of the subject shall be repeated in which the failure occurs.

Rescheduling Courses Failed. A student who wishes to reschedule a course he has failed must do so within his next year of residence, or, if the course is not offered during this year of residence, he must reschedule the course the first time it is offered thereafter during his attendance at Clemson.

Rescheduling Courses Passed. A student may repeat a course he has passed with a grade lower than B provided he does so within three semesters of residence after the completion of his original enrollment in the course.

Scheduling Remedial Mathematics. Any student who has passed a course in freshman mathematics is ineligible to enroll in Remedial Mathematics.

Withdrawal from the University. A student may withdraw from the University any time before the last three weeks of classes in the semester without having grades recorded. A student enrolled the last three weeks of classes shall have final semester grades recorded.

A student withdrawing from college after preliminary reports are due must be passing a minimum of 12 semester credit hours at the time of withdrawal to qualify for re-enrollment the following semester.

After the first withdrawal from college the student is eligible to continue his enrollment the following semester, provided he meets other applicable regulations. For each succeeding withdrawal, however, the student shall be ineligible to continue his enrollment the following semester unless there are extenuating circumstances approved by the Admissions Committee.

Grade Points. Four grade points are assigned for each credit hour on which the student receives the grade of A, 3 grade points for each credit hour of grade B, 2 grade points for each credit hour of grade C, and 1 grade point for each credit hour of grade D. No grade points are assigned for grades F, I, WP, or WF.

Grade-Point Ratio. In calculating a student's grade-point ratio, the total number of grade points accumulated by the student is divided by the total number of credit hours taken by the student at Clemson during the semester, session, or other period for which the ratio is calculated.

The grade-point ratio of students entering college for the first time will be determined as follows: Students entering during the summer sessions or fall semester will have only those courses passed for credit during the summer sessions and/or the following fall semester counted toward their grade-point ratio; students entering the spring semester will have only those courses passed for credit during the spring semester and/or the following summer sessions counted toward their grade-point ratio. This policy does not apply to transfer students.

Minimum Requirements for Continuing Enrollment. At the end of the academic year in May, all student records are inspected for quality. At that time in order to be able to continue his enrollment, a student who has taken a total of:

(a) 24 to 59 credit hours at Clemson must have a cumulative grade-point ratio of 1.30 or above.
(b) 60 to 89 credit hours at Clemson must have a cumulative grade-point ratio of 1.50 or above.
(c) 90 or more credit hours at Clemson must have a cumulative grade-point ratio of 1.70 or above.

A student completing a regular session has the privilege of continuing his enrollment through the immediately following summer session at Clemson or in Clemson parallel programs in an effort to meet the above requirements.

A student who has taken fewer than 90 credit hours at Clemson and who fails to meet the required grade-point ratio, as indicated in the table above, may apply for readmission after a minimum of one semester has elapsed. A student who has taken 90 or more credit hours and fails to meet the required grade-point ratio is permanently ineligible for readmission. Any exceptions to these minimum requirements for continuing enrollment and readmission must be approved by the Admissions Committee of the University.

Advanced Placement by Examination. In addition to earning credit by the usual method involving classroom attendance, students may receive credit toward their degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Credit by Examination. Credit may be earned by means of a special examination without the necessity of class attendance subject to the following requirements:

(1) The applicant must present evidence which would indicate that he has received training or taken work which is approximately equivalent to that given in the course at Clemson for which an examination is requested and that an examination is warranted.

(2) The applicant must not have previously failed or audited the course at Clemson.

(3) The applicant must apply in writing for the examination and the request must be approved by the instructor, head of the de-

partment in which the course is taught, dean of the college or school in which the course is taught, and the Dean of Admissions and Registration.

(4) A grade of not less than C on the examination is necessary in order for the examinee to receive credit on the course. An examinee receiving credit under this provision receives credit for "hours taken," "hours earned," and grade points as well as the course grade.

(5) The time of the examination will be arranged by the student with the instructor concerned, but must be taken within one month after the date of final approval or it will be necessary for the student to initiate another request.

Work Taken at Another Institution. Clemson students may receive credit for work taken at another institution; however, approval of the work should be obtained by the student prior to scheduling the work. Information and forms relative to this approval may be obtained in the Office of Admissions and Registration. By obtaining advance approval the student is assured of receiving proper credit at Clemson provided he passes the work with a grade of C or higher.

Classification. All new students are classified as freshmen unless they have attended another college prior to entrance. For those students who have completed college work elsewhere, classification will be based on semester hours accepted at Clemson rather than the amount of work presented.

To be classified as a sophomore, a student must have completed at least 30 semester hours.

To be classified as a junior, a student must have completed at least 60 semester hours.

To be classified as a senior, a student must have completed at least 95 semester hours.

Regular Advancement in Classification. All students are urged to meet the requirements for sophomore classification by the beginning of the second year, for junior classification by the beginning of the third year, and for senior classification by the beginning of the fourth year. Failure to meet these requirements can jeopardize a student's academic standing with the University as well as jeopardize his deferment under the Selective Service even though he may be otherwise eligible for the deferment.

Course Prerequisites. Prerequisites for individual courses are enumerated under the course listings in the Description of Courses. In addition to these requirements, colleges, schools, and departments may also establish other standards as conditions for enrollment. In the College of Engineering a grade-point ratio of 1.80 or higher is required for registration in all engineering courses numbered 300 or higher. In the College of Nursing, a grade-point ratio of 1.80 or higher is required for registration in all nursing courses numbered 300 or higher.

Credit Load. Except for an entering freshman, who is restricted to the curriculum requirements of his major course, the credit load for an undergraduate must be approved by his class adviser. The class adviser will approve a credit load deemed in the best interest of the student based on such factors as course requirements, grade-point ratio, participation in other activities, and expected date of graduation.

Since grades are an important factor in determining credit loads, the student should be guided by the following table in presenting his schedule to his class adviser for approval:

Grade-Point Ratio (Semester or Cumulative, Whichever Is Higher)	*Recommended Maximum Number of Semester Hours to Be Scheduled*
0.00 to 0.99	14 to 16
1.00 to 1.99	16 to 18
2.00 to 2.99	18 to 20
3.00 to 4.00	20 to 22

When any full-time student reduces his credit load below 12 hours, but is still carrying 9 or more, he may be suspended for at least the remainder of the semester upon recommendation of the Vice President for Student Affairs and approval of the President. When a student reduces his credit load below 9 hours he shall be suspended for at least the remainder of the semester.

Auditing Policies. Qualified students may audit courses upon the written approval of the professor, head of the department and the dean of the college or school concerned, and registration with the Dean of Admissions and Registration. Auditors are under no obligation of regular attendance, preparation, recitation, or examination and receive no credit. Participation in classroom discussion and laboratory exercises by auditors is at the discretion of the instructor. A student who has previously audited a course is ineligible for credit by examination.

A full-time undergraduate student with approval may audit courses at no additional charge as long as the student's credit load, including the course audited, is approved by his class adviser.

A graduate student regularly enrolled for a minimum of six semester hours may, with approval, audit one additional course without charge.

Members of the University teaching staff and the professional staff in research and agricultural extension may with approval audit courses without charge. Other full-time University employees may audit without charge with the additional approval of the employee's immediate supervisor and the Comptroller.

Residence Requirement for Graduation. In order to qualify for an undergraduate degree, a student must spend at least the last year of residence at Clemson and complete at Clemson a minimum of 30 of the last 36 credits presented for the degree.

Honors Program. The Honors Program at Clemson University provides for the fuller development of our most able students. They meet in small classes with outstanding professors and explore the subject matter of a course in greater depth than other students are able to do. The identification and selection of Honor Students begins with their freshman year, and Honors courses are provided at all four levels of undergraduate instruction. To remain in the Honors Program a student must maintain a cumulative grade-point ratio of 3.00.

An Honors Council composed of faculty members from each college and school is responsible for planning and supervising the Honors Program. *The Honors Program: A Student Handbook* is available for those who are interested.

Honors and Awards Day. Each spring an Honors and Awards Day is held for students who qualify for the honor list and for special awards. A cumulative grade-point ratio of 3.00 to 3.49 is required for listing with honor, 3.50 to 3.79 for high honor, and 3.80 or above for inclusion with highest honor.

Honor Graduates. Students who graduate in the Honors Program will have this fact indicated on their diplomas. Other graduates who meet the required qualifications are designated as having graduated with honor. A grade-point ratio of 3.00 to 3.49 is required for graduation with honor, 3.50 to 3.79 for high honor, and 3.80 or above for graduation with highest honor.

Examination on F Received in Last Semester. A candidate for a degree who, in the semester immediately prior to graduation, fails to graduate because of an F on one course taken in that semester may stand a special examination on the course provided:

(1) That the candidate can furnish evidence of having done satisfactory study for the examination.

(2) That the examination is not given until after the regular degree date.

(3) That the candidate has fulfilled, prior to the due date for candidates' grades, all other requirements for his degree except those which can be fulfilled by passing the examination.

(4) That the candidate by removing the F by examination will finish all requirements for his degree which will be awarded on the next regular date for award of degrees.

Make-ups of I's Received in Last Semester. A candidate for a degree who in the semester immediately prior to graduation receives one or more grades of I shall have an opportunity of removing the unsatisfactory grades provided the final grades are received in the Office of Admissions and Registration by the time grades for candidates for graduation are due.

A candidate who qualifies for graduation under this regulation will be awarded his degree on the regular date for the award of degrees.

Special Graduation Requirements. A cumulative grade-point ratio of 2.00 is required for graduation. Candidates for degrees are required to apply for their diplomas within two weeks following the opening of the final semester or the opening of the summer session prior to the date the degrees are to be awarded. These applications should be filled out in the Office of Admissions and Registration on the regular blanks provided.

All work for a degree must be completed, all financial settlements made, and all government property and library books returned by 5 p. m. on the Tuesday preceding graduation.

A student in line for graduation at the end of this semester who fails to graduate because of an F on one course taken this semester may stand a special examination under certain conditions on the course *after the regular degree date.* A senior who qualifies for graduation under this provision will be awarded his degree *on the next regular date* for the award of degrees. For further information see paragraph Examination on F Received in Last Semester.

A student in line for graduation at the end of a semester or summer term who meets all requirements for graduation except for a deficiency in his grade-point ratio resulting from a deficiency of not more than six grade points shall have the privilege of making up his deficiency by standing special reexaminations under certain conditions.

The examinations shall be taken after the regular degree date and in courses totaling not more than six semester credit hours which were passed during the last year of residence, and only one such examination may be taken on an individual course. When such examinations are taken under the above provision, the credit hours of the course or courses will not be counted as additional credit hours taken. Only the grade points over and above the grade points previously earned in the course may count toward raising the grade-point ratio.

A student who qualifies for graduation under this provision will be awarded his degree on the next regular date for the award of degrees.

If all work toward a degree is not completed within five years after entrance, the student may be required to take additional courses.

PART V

DEGREES AND CURRICULUMS

PART V—Degrees and Curriculums

BACHELORS' DEGREES

The degree of Bachelor of Science is awarded to those students who satisfactorily complete one of the four-year curriculums offered under the College of Agricultural Sciences, the College of Engineering, or the College of Forest and Recreation Resources. In the College of Education, the Bachelor of Science degree is awarded to those completing the requirements in Agricultural Education, Industrial Education, and Science Teaching. The Bachelor of Arts degree is granted to those completing the curriculum in Early Childhood Education, Elementary Education or the Secondary Education curriculum with a teaching major in Economics, English, History, Modern Languages, Mathematics, Natural Sciences, Political Science, Psychology, or Sociology. In the College of Industrial Management and Textile Science, the Bachelor of Arts degree is awarded to those completing the curriculum in Economics; and the Bachelor of Science degree is awarded to those completing the requirements in Accounting, Administrative Management, Financial Management, Industrial Management, Textile Chemistry, or Textile Science. In the College of Liberal Arts, the Bachelor of Arts degree is awarded to those students who satisfactorily complete the curriculum with major concentrations in English, History, Modern Languages, Political Science, Psychology, or Sociology. In the College of Nursing, the Bachelor of Science degree is awarded to those students completing requirements in the four-year Nursing curriculum. In the College of Physical, Mathematical, and Biological Sciences, the Bachelor of Science degree is awarded to those students completing the requirements in Botany, Chemistry, Geology, Mathematics, Medical Technology, Microbiology, Physics, Pre-medicine and Pre-dentistry, Zoology, and the Bachelor of Arts degree is awarded to those completing the Arts and Sciences curriculum with major emphases in chemistry, geology, mathematics, or physics.

The College of Architecture offers coordinated undergraduate and graduate curricula in the fields of architecture, building construction, city and regional planning, and visual studies. At undergraduate level the architectural student may elect to take either the Bachelor of Arts in Pre-architecture program or the Bachelor of Science Pre-architecture option. This four-year sequence is followed by an intensive two-year graduate program leading to the professional degree Master of Architecture with concentration in building systems, general design, health facilities planning, or building science. The Pre-architectural sequences in arts or science include a minimum of 134 credit hours of study, and an additional 60 hours in the graduate program for a total of 194 credits.

A four-year curriculum is also available to persons wishing to prepare for a career in building construction. This course requires 134 hours of study for the Bachelor of Science in Building Construction degree.

After the four-year Pre-architecture degree program or other acceptable undergraduate programs, the qualified student may opt the two-year graduate professional curriculum in City and Regional Planning, encompassing 60 credit hours and leading to the Master of City and Regional Planning degree.

Graduates of pre-professional programs with appropriate creative accomplishment may elect the two-year graduate sequence in Visual Studies leading to the Master of Fine Arts degree in Painting, Sculpture, Graphics, Design, Printmaking, Photography or Multimedia. These programs each require a minimum of 60 credit hours of graduate professional study.

ASSOCIATE DEGREE

The College of Nursing offers, in addition to the baccalaureate program in nursing, an Associate in Arts degree program in nursing. This program normally requires four semesters—a minimum of 66 semester credit hours.

GRADUATE DEGREES

The degrees of Doctor of Philosophy, Master of Arts, Master of Science, Master of Agricultural Education, Master of Agriculture, Master of Architecture, Master of City and Regional Planning, Master of Education, Master of Engineering, Master of Fine Arts, Master of Forestry, Master of Industrial Education, and Master of Recreation and Park Administration are awarded to those students who satisfactorily complete prescribed graduate programs. Also, the Master of Business Administration degree is available through a joint program with Furman University.

For further information concerning advanced degrees see *The Graduate School Announcements*, which may be obtained from the Office of the Dean of Graduate Studies and University Research.

UNDERGRADUATE CURRICULUMS

Fifty undergraduate curriculums are offered under the Colleges of Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Physical, Mathematical and Biological Sciences, and the College of Nursing. The curriculums under each college and school are listed below:

COLLEGE OF AGRICULTURAL SCIENCES
- Agricultural Economics
- †Agricultural Education
- *Agricultural Engineering
- Animal Industries
- ‡Biology (Entomology)
- Food Science
- Plant Sciences
- Pre-veterinary

COLLEGE OF ARCHITECTURE
- Building Construction
- Pre-architecture

COLLEGE OF EDUCATION
- †Agricultural Education
- Early Childhood Education
- Elementary Education
- Industrial Education
- Science Teaching
- Secondary Education

COLLEGE OF ENGINEERING
- *Agricultural Engineering
- Ceramic Engineering
- Chemical Engineering
- Civil Engineering
- Electrical and Computer Engineering
- Engineering Analysis
- Mechanical Engineering
- Technical Operations

COLLEGE OF FOREST AND RECREATION RESOURCES
- Forestry
- Recreation and Park Administration

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE
- Accounting
- Administrative Management
- Economics
- Financial Management
- Industrial Management
- Textile Chemistry
- Textile Science

COLLEGE OF LIBERAL ARTS
- English
- History
- Modern Languages
- Political Science
- Psychology
- Sociology

COLLEGE OF NURSING
- Baccalaureate Program
- Associate Degree Program

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* Jointly administered by the College of Agricultural Sciences and the College of Engineering.

† Jointly administered by the College of Education and the College of Agricultural Sciences.

‡ Jointly administered by the College of Agricultural Sciences and the College of Physical, Mathematical and Biological Sciences.

College of Physical, Mathematical and Biological Sciences
- Arts and Sciences
- Botany
- Chemistry
- Geology
- Mathematics
- Medical Technology
- Microbiology
- Physics
- Pre-medicine and Pre-dentistry
- Pre-pharmacy
- Zoology

In the curriculums which follow are given the official titles and number of the courses, the descriptive titles, the number of semester hours credit, and in parentheses, the number of hours per week in class and laboratory, respectively.

COLLEGE OF AGRICULTURAL SCIENCES

Modern agriculture is the science, business, and art of producing, processing, and distributing plant and animal products, including those aspects of economics and human relations connected with these activities. Agriculture is a unique area in education because it applies the basic sciences to biological material for economic implications.

Today's agriculture includes much more than farm production. About 6 million people provide supplies and services for farmers, and 10 million process and distribute farm products. These two segments together with farm production, which employs 5 million workers, provide jobs somewhere in agriculture for 21 million Americans—approximately one-third of all jobs.

Thousands of agricultural graduates are needed each year in this basic industry. Our land-grant colleges and universities are now graduating considerably less than the total number needed to fill the jobs available each year—jobs important to every person, jobs with futures, jobs with challenge, jobs with personal and financial rewards.

The total program in Agriculture at this institution includes Resident Instruction, Research (Agricultural Experiment Station), and Extension (Agricultural Extension Service). Organized under Resident Instruction are curriculums in Agricultural Economics, Agricultural Education,* Agricultural Engineering,† Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), Biology (major in Entomology), Food Science, Plant Sciences

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* Jointly administered by the College of Education and the College of Agricultural Sciences.
† Jointly administered by the College of Agricultural Sciences and the College of Engineering.

(majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental), and Pre-veterinary Medicine.

The curriculums in Agriculture are continuously revised to meet the changing needs of this dynamic industry. In this connection, students in many of the curriculums now have the opportunity to specialize by choosing a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

Science Minor—This minor emphasizes the basic sciences that prepare students to contribute to the advancement of knowledge in their respective fields. It is designed for students whose anticipated work requires considerable scientific training, usually including graduate studies. Employment opportunities include research with State Agricultural Experiment Stations, the United States Department of Agriculture, and industrial and commercial organizations; and teaching in colleges of agriculture, and other educational work with Federal, State and industrial organizations.

Business Minor—This minor emphasizes principles and practices of business management as applied to businesses and industries associated with agriculture. It is designed for students who plan to work with one of the many businesses and industries that provide supplies and services for the farmer, and process and distribute farm products. Employment opportunities include work related to meat and poultry processing, sales and service of farm machinery, manufacturing and sales of fertilizers and pesticides, dairy and food processing, grain and seed processing, feed manufacturing, banking and credit, insurance, farm management, land appraising, and the marketing of agricultural commodities.

Production Minor—This minor emphasizes the application of scientific principles to agricultural production. It is designed for students whose anticipated work requires broad general training in scientific and practical agriculture. Employment opportunities include general and specialized farming; agricultural extension services; teaching vocational agriculture; conservation of natural resources; agricultural communication; and agricultural services of the United States Department of Agriculture, State Departments of Agriculture and private enterprises.

International Agriculture Minor—This minor emphasizes the international aspects of agriculture and applies basic scientific principles and agricultural practices to worldwide agriculture. It is designed for students who contemplate work in international agricultural positions either in the United States or abroad. Employment opportunities include positions with the Foreign Agricultural Service of the United States Department of Agriculture, with foundations such as the Ford Foundation, with the Agency for International Development, with industries such as United Fruit Company, and with other domestic and foreign interests.

Second Department Minor—This minor emphasizes special training in an area of study other than the major. A *Second Department* minor may be selected either within or outside of the College of Agricultural Sciences. It is designed for students who wish additional specialized training outside their major area of study. Additional information relative to employment opportunities open to students with a minor in a *Second Department* is given elsewhere in this catalog under the various curriculum listings.

To illustrate further the types of work in which graduates engage, a few of the many occupations of agricultural graduates are listed under each curriculum.

FRESHMAN YEAR CURRICULUMS

[For students in Agricultural Economics, Agricultural Education, Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), and Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental.)]

First Semester

Agric 101 Introd. to Agric.	1	(1,0)
Biol 101 Prin. of Biology	3	(3,0)
Ch 101 Gen. Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)
Hist 102 Amer. History	3	(3,0)
Math 103 College Algebra	2	(3,0)
AS or MS or Elective	1	
	17	

Second Semester

Bot 102 Prin. of Botany	2	(2,0)
Bot 104 Lab. Exer. in Bot.	1	(0,2)
or Zool 104 Lab. Exer. in Zool.	1	(0,2)
Ch 102 Gen. Chemistry	4	(3,3)
or Ch 112 Gen. Chemistry	4	(3,3)
Engl 102 English Composition	3	(3,0)
Math 104 Trigonometry	2	(3,0)
Zool 102 Prin. of Zoology	2	(2,0)
AS or MS or Elective	1	
	15	

[For students in Biology (major in Entomology),* and Food Science.]

First Semester

Agric 101 Introd. to Agric.	1	(1,0)
Biol 101 Prin. of Biology	3	(3,0)
Ch 101 Gen. Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)
Math 103 College Algebra	2	(3,0)
Math 104 Trigonometry	2	(3,0)
AS or MS or Elective	1	
	16	

Second Semester

Bot 102 Prin. of Botany	2	(2,0)
Bot 104 Lab. Exer. in Bot.	1	(0,2)
or Zool 104 Lab. Exer. in Zool.	1	(0,2)
Ch 102 Gen. Chemistry	4	(3,3)
or Ch 112 Gen. Chemistry	4	(3,3)
Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)
Zool 102 Prin. of Zoology	2	(2,0)
AS or MS or Elective	1	
	17	

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* Biology students majoring in Entomology take both Bot 104 and Zool 104.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

The curriculum in Agricultural Economics places emphasis on a strong background in economic theory with applications to agricultural and agriculturally related businesses. Also included are courses in basic agricultural and biological sciences, liberal arts, and business. Students with a major in agricultural economics now have the opportunity to further specialize by selecting a minor in *Science, Business, International Agriculture,* or a *Second Department.*

Employment opportunities open to graduates with degrees in Agricultural Economics are many. They include research and teaching in institutions of higher learning; sales and promotional work for a variety of businesses; management positions in the farm loan departments of private banks or with cooperative farm credit agencies; public relations activities for various firms; market managers and directors; county agents; representatives of government agencies serving agriculture; and operators of numerous enterprises.

AGRICULTURAL ECONOMICS CURRICULUM

AGRICULTURAL ECONOMICS MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 201 Introd. to Animal Ind.	3	(2,3)	Ag Ec 202 Agric. Economics	3	(3,0)
Agron 202 Soils	3	(2,2)	Ag Ec 305 Agric. Bus. Anal.	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	or Acct 201 Prin. of Accounting	3	(3,0)
History–Literature Requirement*	3	(3,0)	Agric 202 Introd. to Plant Sciences	3	(2,3)
Math 106 Cal. of One Var.	4	(5,0)	History–Literature Requirement*	3	(3,0)
AS or MS or Elective	1		Phys 207 Gen. Physics	4	(3,2)
			AS or MS or Elective	1	
	17			17	

JUNIOR YEAR

Ag Ec 309 Econ. of Agric. Marketing	3	(3,0)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Ag Ec 357 Natural Resource Econ.	3	(3,0)	Ag Ec 352 Public Finance	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Ex St 301 Introd. Statistics	3	(2,2)	or Engl 304 Advanced Comp.	3	(3,0)
Minor†	6		Ex St 462 Stat. Applied to Econ.	3	(3,0)
			Minor†	6	
	18			18	

SENIOR YEAR

Ag Ec 405 Seminar	1	(1,0)	Ag Ec 402 Econ. of Agric. Prod.	3	(3,0)
Ag Ec 452 Agricultural Policy	3	(3,0)	Ag Ec 406 Seminary	1	(1,0)
Gen 302 Genetics	4	(3,3)	Ag Ec 456 Prices	3	(3,0)
or RS 401 Human Ecology	3	(3,0)	RS 301 Rural Sociology	3	(3,0)
Minor†	3		Approved Electives	6	
Approved Electives	5 — 6			16	
	16 — 17		134 Total Semester Hours		

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* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† See class adviser for available minors and course requirements.

AGRICULTURAL EDUCATION‡

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations, and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations, and agricultural extension; farming, soil conservation, and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in *Business, International Agriculture,* or in a *Second Department.* Students in other departments may minor in Agricultural Education and be certified to teach.

AGRICULTURAL EDUCATION CURRICULUM

AGRICULTURAL EDUCATION MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ag Ed 201 Introd. to Agric. Ed.	3	(2,2)	AgE 205 Farm Shop	3	(2,3)
Agric 202 Introd. to Plant Sciences	3	(2,3)	AgE 206 Agric. Mechanization	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	Agric 201 Introd. to Animal Ind.	3	(2,3)
History–Literature Requirement*	3	(3,0)	Agron 202 Soils	3	(2,2)
Phys 207 Gen. Physics	4	(3,2)	History–Literature Requirement*	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

AgE 301 Soil and Water Conserva.	3	(2,3)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Agron 301 Fertilizers	3	(3,0)	An Sc 301 Feeds and Feeding	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	For 305 Elements of Forestry	2	(2,0)
Approved Horticulture Elective	3		For 307 Elem. of Forestry Lab.	1	(0,3)
Minor†	3		Minor†	9	
Approved Electives	3			18	
	18				

SENIOR YEAR

Ag Ec 452 Agric. Policy	3	(3,0)	Ag Ed 401 Methods in Agric. Education	3	(2,2)
Ent 301 General Entomology	3	(2,3)	Ag Ed 406 Directed Teaching	6	(0,18)
Hort 407 Landscape Design	3	(2,3)	Ag Ed 422 Introd. to Adult Ed.	3	(2,2)
Pl Pa 401 Plant Pathology	3	(2,3)	Ed 302 Ed. Psychology	3	(3,0)
Minor†	3			15	
Approved Electives	3				
	18				

134 Total Semester Hours

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* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† See class adviser for available minors and course requirements.

‡ Jointly administered by the College of Education and the College of Agricultural Sciences.

AGRICULTURAL ENGINEERING*

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The agricultural engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to the Master of Science, the Master of Engineering, and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, and extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

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* The Agricultural Engineering curriculum is jointly administered by the College of Agricultural Sciences and the College of Engineering.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

AGRICULTURAL ENGINEERING CURRICULUM

AGRICULTURAL ENGINEERING MAJOR

FRESHMAN YEAR

First Semester		*Second Semester*	
Agric 101 Introd. to Agric.	1 (1,0)	Basic Science†	3 — 4
Ch 101 General Chemistry	4 (3,3)	Engl 102 English Composition	3 (3,0)
Engr 180 Engr. Concepts	3 (2,2)	Humanistic–Social Elective	3 (3,0)
or Humanistic–Social Elective	3 (3,0)	or Engr 180 Engr. Concepts	3 (2,2)
Engl 101 English Composition	3 (3,0)	Math 108 Cal. and Linear Alg.	4 (5,0)
Math 106 Cal. of One Var.	4 (5,0)	Phys 122 Mech. and Wave Phen.	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	16		17 — 18

SOPHOMORE YEAR

AgE 221 Soil and Water Res. Engr I	3 (2,3)	AgE 212 Fund. of Mechanization.	3 (2,3)
EG 109 Engr. Grap. Comm.	2 (0,6)	Biol 101 Prin. of Biology	3 (3,0)
EM 201 Engr. Mech. (Statics)	3 (3,0)	EM 202 Engr. Mech. (Dynamics)	3 (3,0)
Literature Requirement*	3 (3,0)	Literature Requirement*	3 (3,0)
Math 206 Cal. of Sev. Var.	4 (5,0)	Math 208 Engr. Math. I	4 (5,0)
Phys 221 Ther. and Elec. Phen.	3 (3,0)	AS or MS or Elective	1
AS or MS or Elective	1		
	19		17

JUNIOR YEAR

AgE 353 Computational Systems	2 (1,3)	AgE 362 Energy Conv. in Ag. Sys.	3 (2,3)
AgE 355 Engr. Anal. and Creat.	2 (1,3)	AgE 465 Engr. Prop. of Biol. Mat.	3 (2,3)
Bot 102 Prin. of Botany	2 (2,0)	Agron 202 Soils	3 (2,2)
E&CE 307 Basic Elec. Engr.	3 (3,0)	E&CE 320 Electronics I	2 (2,0)
EM 304 Mechanics of Materials	3 (3,0)	Phys 222 Opt. and Mod. Phys.	3 (3,0)
ME 311 Engr. Thermo. I	3 (3,0)	Humanistic—Social Elective	3 (3,0)
Zool 102 Prin. of Zoology	2 (2,0)		
	17		17

SENIOR YEAR

AgE 431 Agric. Struct. Design	3 (2,3)	AgE 416 Agric. Machinery Design	3 (2,3)
AgE 471 Undergraduate Research	1 (0,3)	AgE 422 Soil & Water Res. Engr. II	3 (2,3)
Econ 201 Principles of Econ.	3 (3,0)	AgE 442 Agric. Proc. Engr.	3 (2,3)
EM 320 Fluid Mechanics	3 (3,0)	Bot 352 Plant Physiology	4 (3,3)
Math 301 Stat. Theory and Meth. I	3 (3,0)	or Zool 307 Animal Anat. and Physiol.	3 (2,3)
Free Elective	4 — 3	or Micro 305 Gen. Microbiology	4 (3,3)
	17 — 16	ME 304 Heat Transfer I	3 (3,0)
		Free Electives	2 — 3
			18

138 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† To be selected from Ch 102 or 112.

ANIMAL INDUSTRIES

The Animal Industries curriculum includes three majors—Animal Science, Dairy Science, and Poultry Science.

ANIMAL SCIENCE

The Animal Science Department emphasizes subject matter dealing with the application of scientific principles to livestock production and processing.

Students will minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

Occupations for Animal Science graduates include livestock farming; cattle, swine and sheep breeding; extension livestock specialists; feed specialists; county agents; teaching and research in animal industry; positions with meat packing companies; feed dealers; freezer locker operators; livestock dealers; and livestock commission brokers.

ANIMAL INDUSTRIES CURRICULUM

ANIMAL SCIENCE MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chemistry†	3	(3,0)	Agric 202 Introd. to Plant Sciences	3	(2,3)
Ch 227 Org. Chem. Lab.†	1	(0,3)	An Sc 201 Introd. to Animal Sci.	2	(2,0)
or Ch 201 Gen. Chemistry	4	(3,3)	An Sc 203 Introd. to An. Sci. Lab.	1	(0,3)
or Bioch 210 Elem. Biochem.	4	(3,3)	History–Literature Requirement*	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Phys 207 Gen. Physics	4	(3,2)
History–Literature Requirement*	3	(3,0)	Minor‡	3	
Zool 307 Animal Anat. and Phys.	3	(2,3)	AS or MS or Elective	1	
Minor‡	3				
AS or MS or Elective	1				
	17			17	

JUNIOR YEAR

An Sc 301 Feeds and Feeding	3	(3,0)	An Sc 303 Feeds and Feed. Lab.	1	(0,3)
An Sc 353 Meats	2	(2,0)	An Sc 306 Livestock Sel. & Eval.	2	(1,3)
An Sc 355 Meats Lab.	1	(0,3)	Engl 301 Public Speaking	3	(3,0)
Gen 302 Genetics	4	(3,3)	Social Science Elective§	3	(3,0)
Micro 305 Gen. Microbiology	4	(3,3)	Minor‡	6	
Approved Elective	3		Approved Elective	3	
	17			18	

SENIOR YEAR

An Sc 401 Beef Production	3	(3,0)	An Sc 406 Seminar	2	(2,0)
An Sc 403 Beef Prod. Lab.	1	(0,3)	An Sc 408 Pork Production	3	(3,0)
Dy Sc 453 Animal Reprod.	3	(3,0)	An Sc 410 Pork Prod. Lab.	1	(0,3)
Nutr 401 Fundamentals of Nut.	3	(3,0)	An Sc 452 Animal Breeding	3	(3,0)
Minor‡	3		Approved Electives	7	
Approved Electives	4				
	17			16	

134 Total Semester Hours

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* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† Required for Science Minor.

‡ See class adviser for available minors and course requirements.

§ To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

DAIRY SCIENCE

The major in Dairy Science is designed to provide the student with an understanding of scientific principles and the application of these principles in the scientific, technical, and business phases of the dairy industry. Completion of required studies in the sciences and humanities and selected courses by the student in areas of personal interest prepares the graduate for a successful chosen profession. A career in the dairy industry is a rewarding one, not only monetarily, but in rendering a service in providing a wholesome, nutritious food for mankind.

Opportunities for dairy science graduates are many. They include the management of production and processing facilities, quality control work for processing units and production organizations, industrial promotion and public relations work in both production and processing fields, dairy and food products engineering, special services, public health service, teaching and research. Special service opportunities are available in state and national breed association work, breeding organizations, industrial supplies, production and processing equipment and supplies. Opportunities in educational activities include positions with industrial associations, state and federal services and federal programs with foreign assignments.

Students majoring in Dairy Science may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

ANIMAL INDUSTRIES CURRICULUM

DAIRY SCIENCE MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Agron 202 Soils	3	(2,2)
Ch 223 Org. Chemistry	3	(3,0)	History–Literature Requirement*	3	(3,0)
Ch 227 Org. Chem. Lab.	1	(0,3)	Phys 207 Gen. Physics	4	(3,2)
or Ch 201 Gen. Chemistry	4	(3,3)	Social Science Elective†	3	
or Bioch 210 Elem. Biochem.	4	(3,3)	Minor‡	3	
Dy Sc 201 Introd. to Dairy Science	3	(2,3)	AS or MS or Elective	1	
Econ 201 Principles of Econ.	3	(3,0)		17	
History–Literature Requirement*	3	(3,0)			
AS or MS or Elective	1				
	17				

JUNIOR YEAR

Dy Sc 307 Market Milk	3	(2,3)	An Sc 301 Feeds and Feeding	3	(3,0)
Fd Sc 305 Dairy and Food Engr.	3	(2,3)	Dy Sc 306 Ch. & Phys. Nat. of Milk	3	(2,3)
Fd Sc 414 Fd. Qual. Control Lab.	2	(1,3)	Gen 302 Genetics	4	(3,3)
or Dy Sc 310 Dy. Cattle Select.	1	(0,3)	Minor‡	3	
Micro 305 Gen. Microbiology	4	(3,3)	Approved Electives	3 — 4	
Minor‡	6			16 — 17	
	18 — 17				

SENIOR YEAR

First Semester			*Second Semester*		
Dy Sc 409 Dairy Sci. Seminar	2	(2,0)	An Sc 452 Animal Breeding	3	(3,0)
Dy Sc 453 Animal Reproduction	3	(3,0)	or Dy Sc 404 Plant Mgt.	3	(2,3)
and Dy Sc 455 Animal Reproduction Lab.	1	(0,3)	Dy Sc 410 Dairy Sci. Seminar	2	(2,0)
or Dy Sc 402 Dairy Manuf.	4	(3,3)	Dy Sc 452 Dairy Cattle Feeding and Management	3	(2,3)
Nutr 401 Fundamentals of Nut.	3	(3,0)	Micro 402 Dairy Microbiology	3	(2,3)
Minor‡	3		Approved Elective	6	
Approved Elective	5				
	17			17	

134 Total Semester Hours

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* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† To be selected from the following: Pol Sc 301, Psych 201, Soc 201, Phil 201, RS 301, 401.

‡ See class adviser for available minors and course requirements.

POULTRY SCIENCE

The Poultry Science major is expected to gain knowledge in the basic disciplines within which the poultry industry operates and specialized knowledge on the biology of the avian species. Technical poultry courses emphasize the nutrition, physiology, genetics and pathology of domesticated birds and the environmental requirements for incubation of eggs, production of meat and eggs and handling of products.

Minors in *Science, Business, Production, International Agriculture,* or a *Second Department* provide for the specialized interest of the student within the broad area encompassed by Poultry Science.

Job opportunities for Poultry Science majors who minor in *Science* include teaching, extension and research positions in colleges, government laboratories or in industry. This usually involves graduate work. *Business* minors are especially equipped to move into management positions in the small to large corporations in feed manufacturing, production, processing, and marketing of poultry products. *Production* minors are trained for operation of poultry farms, general farms, or as extension agents working with farmers. *International Agriculture* minors are expected to export the technical information and techniques so successful in the American poultry industry to a protein-short world. Many American poultry firms are operating on a worldwide basis and our own government and foreign nations are interested in assistance in transferring poultry knowledge to underdeveloped areas.

Students who hope to work in broad agricultural areas that include poultry and other agricultural segments may find a minor in a *Second Department* helpful. This includes such opportunities as agricultural chemicals, pharmaceuticals, biologicals, feed manufacturers, breeding organizations, marketing organizations, publishers, advertisers, and poultry farmers involved in another enterprise.

ANIMAL INDUSTRIES CURRICULUM

POULTRY SCIENCE MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Econ 201 Principles of Econ.	3	(3,0)
Ch 223 Org. Chemistry†	3	(3,0)	History–Literature Requirement*	3	(3,0)
Ch 227 Org. Chem. Lab.†	1	(0,3)	Micro 305 Gen. Microbiology	4	(3,3)
or Ch 201 Gen. Chemistry	4	(3,3)	Phys 207 Gen. Physics	4	(3,2)
or Bioch 210 Elem. Biochem.	4	(3,3)	PS 352 Breeder Flock and Hatchery Mgt.	3	(3,0)
Gen 302 Genetics	4	(3,3)	PS 353 Breeder Flock and Hatchery Mgt. Lab.	1	(0,3)
History–Literature Requirement*	3	(3,0)	AS or MS or Elective	1	
PS 201 Introd. to Poultry Science	3	(2,3)			
AS or MS or Elective	1				
	18			19	

JUNIOR YEAR

An Sc 301 Feeds and Feeding	3	(3,0)	PS 359 Management of Egg, Broiler, and Turkey Enterprises	3	(2,3)
Engl 301 Public Speaking	3	(3,0)	PS 451 Poultry Nutrition	2	(2,0)
PS 355 Poult. Prod. Grad. & Tech.	3	(2,3)	Dept. Major Requirement¶	3	
Zool 307 Animal Anat. & Physiol.	3	(2,3)	Minor§	6	
Social Science Elective‡	3		Approved Electives	2	
Minor§	3				
	18			16	

SENIOR YEAR

PS 401 Animal Environ. Tech.	2	(2,0)	PS 460 Seminar	2	(2,0)
PS 403 Ani. Environ. Tech. Lab.	1	(0,3)	Dept. Major Requirement¶	3 — 2	
PS 458 Avian Microbiology and Parasit.	4	(3,3)	Minor§	3	
Dept. Major Requirement¶	3		Approved Electives	7 — 8	
Minor§	3			15	
Approved Electives	3				
	16				

134 Total Semester Hours

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* One course to be selected from each of the following groups. (At least one literature course is required.)

Group I: Engl 203, 205, 207, 231, Hist 171, 172.

Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† Science minors should schedule Ch 223, 227. Business minors may substitute Acct 201.

‡ To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

§ See class adviser for available minors and course requirements.

¶ See class adviser for department major requirements.

BIOLOGY (Entomology Major)

The Entomology major in the Biology curriculum is described below.

ENTOMOLOGY

Entomology is that branch of science that deals with the study of insects. In many ways insects are the most important group of animals that affect man. At the present time insects are costing the American public approximately four billion dollars annually. There will always be a need for qualified entomologists and the financial rewards to members of this profession are comparable to those enjoyed by most other scientists.

Depending on training, ability, and interest, entomologists find employment in such areas as the following: (1) research entomologist with several federal agencies, the state experiment stations, or private research foundations; (2) teaching entomology and/or zoology at the college or university level; (3) industrial research and the development of more efficient insecticides; (4) quarantine and regulatory work at both state and federal levels; (5) sales and management for agricultural chemical or the pest control industries; (6) the federal and state extension services; (7) many other specialized areas where a knowledge of insects is essential, such as beekeeping or disease transmission.

BIOLOGY CURRICULUM

ENTOMOLOGY MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 201 Introd. to Animal Indus.	3	(2,3)	Agric 202 Introd. to Plant Sciences	3	(2,3)
Ch 223 Org. Chemistry	3	(3,0)	Ch 224 Org. Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
or Ch 201 Gen. Chemistry	4	(3,3)	or Bioch 210 Elem. Biochem.	4	(3,3)
Econ 201 Principles of Econ.	3	(3,0)	or Ch 313 Quant. Analysis	3	(3,0)
Literature Requirement*	3	(3,0)	and Ch 317 Quant. Anal. Lab.	1	(0,3)
Approved Elective†	1		Ent 301 General Entomology	3	(2,3)
AS or MS or Elective	1		Literature Requirement*	3	(3,0)
			Social Science Elective‡	3	
			AS or MS or Elective	1	
	15			17	

JUNIOR YEAR

First Semester			*Second Semester*		
Ent 401 Field Cr. St. Prod. Insects	3	(2,3)	Ent 402 Fruit, Nut, Veg. Insects	3	(2,3)
Phys 207 Gen. Physics	4	(3,2)	Micro 305 Gen. Microbiology	4	(3,3)
Social Science Elective‡	3	(3,0)	Phys 208 Gen. Physics	4	(3,2)
Approved Electives†	6		Approved Electives†	6	
	16			17	

SENIOR YEAR

First Semester			*Second Semester*		
Engl 301 Public Speaking	3	(3,0)	Ent 410 Insect Taxonomy	3	(1,6)
Ent 405 Insect Morphology	4	(3,3)	Ent 462 Seminar	1	(1,0)
Ent 461 Seminar	1	(1,0)	Gen 302 Genetics	4	(3,3)
Pl Pa 401 Plant Pathology	3	(2,3)	Zool 460 Gen. Physiology	3	(2,3)
Zool 411 Animal Ecology	3	(2,3)	Social Science Elective‡	3	
Approved Electives†	4		Approved Electives†	4	
	18			18	
			134 Total Semester Hours		

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

†Agron 202 must be included.

‡ To be selected from the following: Ag Ec 202, Econ 202, Geog 301, 302, Hist 102, 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, 302, RS 301, 401, Soc 201.

FOOD SCIENCE

The Food Science curriculum is designed to prepare students for the many career opportunities in technical and management areas of the food industry. The food industry, being the nation's largest industry, is becoming increasingly technical and requires large numbers of professional food scientists. World food supplies, particularly those rich in protein, are becoming increasingly critical in many parts of the globe. This situation is expected to accelerate the demand for food scientists.

Opportunities for graduates in Food Science include research positions in government organizations and state experiment stations, supervisory, administrative, research, and quality control positions in food processing industries, inspection and grading work with state and federal agencies, consulting, and teaching and extension activities with universities and colleges. Students graduating in Food Science are well prepared to pursue postgraduate training in areas such as microbiology, biochemistry, nutrition, as well as in Food Science.

The student majoring in Food Science will select a minor in *Science, Business, International Agriculture,* or a *Second Department* which will emphasize training in an area other than Food Science and which is designed to supplement the major course of study.

FOOD SCIENCE CURRICULUM

FOOD SCIENCE MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chem.	3	(3,0)	Bioch 210 Elem. Biochem.	4	(3,3)
Ch 227 Org. Chem. Lab.	1	(0,3)	Fd Sc 212 Man's Food Resources	2	(2,0)
or Ch 201 Gen. Chemistry	4	(3,3)	History–Literature Requirement[*]	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Phys 208 Gen. Physics	4	(3,2)
History–Literature Requirement[*]	3	(3,0)	Social Science Elective[†]	3	
Phys 207 Gen. Physics	4	(3,2)	AS or MS or Elective	1	
Social Science Elective[†]	3			17	
AS or MS or Elective	1				
	18				

JUNIOR YEAR

Fd Sc 305 Dairy and Food Engr.	3	(2,3)	Engl 301 Public Speaking	3	(3,0)
Fd Sc 311 Food Processing	3	(3,0)	Fd Sc 312 Food Processing	3	(3,0)
Fd Sc 313 Food Processing Lab.	1	(0,3)	Fd Sc 314 Food Process. Lab.	1	(0,3)
Micro 305 Gen. Microbiology	4	(3,3)	Micro 404 Food Microbiology	3	(2,3)
Minor[‡]	3		Minor[‡]	3	
Approved Elective	2		Approved Electives	4	
	16			17	

SENIOR YEAR

Ex St 301 Introd. Statistics	3	(2,2)	Fd Sc 412 Food Quality Control	2	(2,0)
Fd Sc 413 Biochem. of Foods	2	(2,0)	Fd Sc 414 Food Qual. Con. Lab.	2	(1,3)
Fd Sc 415 Human Nutrition	2	(2,0)	Fd Sc 416 Food Analysis	2	(1,3)
Minor[‡]	6		Fd Sc 418 Seminar	1	(1,0)
Approved Electives	4		Minor[‡]	3	
	17		Approved Electives	6	
				16	

134 Total Semester Hours

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[*] One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

[†] To be selected from the following: Hist 102, Soc 201, Phil 201, Pol Sc 301, Psych 201, RS 301, 401.

[‡] See class adviser for available minors and course requirements.

PLANT SCIENCES

The Plant Sciences curriculum includes three majors—Agronomy—Crops and Soils, Horticulture (Fruit and Vegetable), and Horticulture (Ornamental).

AGRONOMY—CROPS AND SOILS

Agronomy is the science that deals with crops and soils. The crop science area includes plant breeding and genetics as related to crop improvement and variety introductions. Special emphasis is also placed on the science of weed control and management for field, forage and pasture crops.

Soil science covers soil formation, classification, management and fertility. The student acquires a basic understanding in chemistry, physics, and biology as related to soil properties and land use.

Training in this area also includes those factors associated with land-pollution problems.

The science-oriented graduate can pursue research with both public and private agencies investigating problems associated with improving the world's crops and soils, determining pesticide residues in soil and water, or charting fertilizer ion movement through the soil-plant system. Research agronomists are currently studying the soils obtained from the moon.

Positions for Agronomy graduates are available with the Agricultural Extension Service, the Soil Conservation Service, Forest Service, Farmers Home Administration, Production Credit Associations and other public agencies. International opportunities are also available to the agronomist. Agronomists are employed with agri-chemical, seed and other industries as technical, supervisory and sales agronomists. Banks and other financial institutions employ agronomists as appraisers and farm managers. Other agronomists may return to the farm either as a manager or owner-manager.

The science of Agronomy is basic to all agriculture and the graduate will find many opportunities to serve in modern agriculture.

Students majoring in Agronomy—Crops and Soils will declare a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

AGRONOMY—CROPS AND SOILS MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester

Agric 202 Introd. to Plant Sciences	3	(2.3)
Ch 223 Org. Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)
or Ch 201 Gen. Chemistry	4	(3,3)
or Bioch 210 Elem. Biochem.	4	(3,3)
Econ 201 Principles of Econ.	3	(3,0)
History–Literature Requirement*	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)
AS or MS or Elective	1	
	18	

Second Semester

Agric 201 Introd. to Animal Ind.	3	(2,3)
Agron 202 Soils	3	(2,2)
History–Literature Requirement*	3	(3,0)
Minor†	6	
AS or MS or Elective	1	
	16	

JUNIOR YEAR

First Semester		*Second Semester*	
Agron 301 Fertilizers‡	3 (3,0)	Agron 308 Soil and Plant Anal.	3 (1,6)
Agron 410 Cotton and Other Fiber Crops‡	2 (2,0)	Agron 320 Forage & Pas. Crops‡	3 (3,0)
or Agron 411 Grain Crops	2 (2,0)	Agron 322 Forage Crops Lab.‡	1 (0,2)
or Agron 412 Tobacco and Spec. Use Crops	2 (2,0)	Agron 410 Cotton and Other Fiber Crops‡	2 (2,0)
Bot 352 Plant Physiology	4 (3,3)	or Agron 411 Grain Crops	2 (2,0)
Gen 302 Genetics	4 (3,3)	or Agron 412 Tobacco and Spec. Use Crops	2 (2,0)
Micro 305 Gen. Microbiology	4 (3,3)	Social Science Elective§	3
		Minor†	6
	17		18

SENIOR YEAR

Agron 403 Soil Genesis and Classification‡	2 (1,3)	Agron 405 Plant Breeding‡	3 (2,2)
Agron 407 Prin. of Weed Control‡	3 (2,2)	or Micro 410 Soil Microbiology	3 (2,3)
Agron 455 Seminar	1 (1,0)	Agron 452 Soil Fert. and Mgt.‡	2 (2,0)
Minor†	3 — 7	Agron 456 Seminar	1 (1,0)
Approved Electives	6	Minor†	0 — 4
		Approved Electives	12 — 8
	15 — 19		18 — 14

134 Total Semester Hours

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* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† See class adviser for available minors and course requirements.

‡ Required for all students except science minors. Science minors select 13 credits from these courses.

§ To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

HORTICULTURE (Fruit and Vegetable)

This major provides the student with a basic education in science and the humanities, and the application of both in the scientific, technical, and business phases of the fruit and vegetable industry.

Opportunities in this field of study include vegetable and fruit farm management; inspection of fresh fruit, vegetable and other food products as well as nursery stock. There are many other opportunities as in plant breeding, agricultural extension service work, horticultural research, horticultural teaching and writing, and fruit and vegetable processing. Other occupations include sales and field work with seedsmen and nurserymen, and manufacturers of food, fertilizer, and pesticide products.

Students majoring in the fruit and vegetable phase of Horticulture may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

HORTICULTURE (Fruit and Vegetable) MAJOR

(See page 117 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
Agron 202 Soils	3	(2,2)	Agric 201 Introd. to Animal Ind.	3	(2,3)
Ch 223 Org. Chemistry	3	(3,0)	Ent 301 General Entomology	3	(2,3)
Ch 227 Org. Chemistry Lab.	1	(0,3)	History–Literature Requirement[*]	3	(3,0)
or Ch 201 Gen. Chemistry	4	(3,3)	Phys 207 Gen. Physics	4	(3,2)
or Bioch 210 Elem. Biochem.	4	(3,3)	Approved Electives	3	
Econ 201 Principles of Econ.	3	(3,0)	AS or MS or Elective	1	
History–Literature Requirement[*]	3	(3,0)		17	
Hort 201 Gen. Horticulture	3	(2,2)			
AS or MS or Elective	1				
	17				

Junior Year

Gen 302 Genetics	4	(3,3)	Bot 352 Plant Physiology	4	(3,3)
Hort 305 Plant Propagation	3	(2,3)	Hort 302 Prin. Veg. Prod.	3	(2,3)
Hort 352 Commercial Pomology	3	(2,3)	Hort 451 Small Fruit Culture	3	(2,3)
Social Science Elective[†]	3		Micro 305 Gen. Microbiology	4	(3,3)
Minor[‡]	3		Minor[‡]	3	
Approved Electives	3			17	
	19				

Senior Year

Hort 405 Nut Tree Culture	2	(2,0)	Hort 410 Seminar	1	(1,0)
Hort 407 Landscape Design	3	(2,3)	Hort 456 Vegetable Crops	3	(3,0)
Hort 409 Seminar	1	(1,0)	Minor[‡]	6	
Hort 464 Post Harvest Hort.	3	(2,2)	Approved Electives	4	
Pl Pa 401 Plant Pathology	3	(2,3)		14	
Minor[‡]	3				
Approved Electives	3				
	18				

134 Total Semester Hours

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[*] One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

[†] To be selected from the following: Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

[‡] See class adviser for available minors and course requirements.

HORTICULTURE (Ornamental)

This major is designed to give students a scientific background and technical facilities in the field of Ornamental Horticulture. Subject matter covers plant materials culture, uses, and planning of ground spaces.

Graduates find careers in nursery work, floriculture, landscape designing, landscape contracting, turf management, and park supervision. Other occupations are research personnel, teachers, extension workers, and representatives of fertilizer, machinery, and chemical companies.

Students desiring to major in Ornamental Horticulture may choose a minor in *Science, Business, Production, International Agriculture,* or a *Second Department.*

PLANT SCIENCES CURRICULUM

HORTICULTURE (ORNAMENTAL) MAJOR

(See page 117 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
AgE 301 Soil and Water Con.	3	(2,3)	Agron 202 Soils	3	(2,2)
Ch 223 Org. Chemistry	3	(3,0)	Ent 301 General Entomology	3	(2,3)
Ch 227 Org. Chemistry Lab.	1	(0,3)	History–Literature Requirement*	3	(3,0)
or Ch 201 Gen. Chemistry	4	(3,3)	**Phys 207 Gen. Physics**	**4**	**(3,2)**
or Bioch 210 Elem. Biochem.	4	(3,3)	**Approved Electives**	3	
Econ 201 Principles of Econ.	3	(3,0)	**AS or MS or Elective**	1	
History–Literature Requirement*	3	(3,0)			
Hort 201 Gen. Horticulture	3	(2,2)			
AS or MS or Elective	1				
	17			17	

JUNIOR YEAR

Bot 352 Plant Physiology	**4**	**(3,3)**	Hort 304 Plant Materials II	3	(2,3)
Gen 302 Genetics	**4**	**(3,3)**	Hort 308 Landscape Design	3	(2,3)
Hort 303 Plant Materials I	**3**	**(2,3)**	Hort 310 Floriculture	3	(2,3)
Hort 305 Plant Propagation	**3**	**(2,3)**	Minor‡	6	
Social Science Elective†	**3**		Approved Electives	3	
	17			18	

SENIOR YEAR

Hort 408 Floral Design and Retail Marketing	**2**	**(1,3)**	Hort 406 Nursery Technology	3	(2,3)
Hort 409 Seminar	**1**	**(1,0)**	Hort 410 Seminar	1	(1,0)
Hort 412 Turf Management	**3**	**(2,3)**	Pl Pa 401 Plant Pathology	3	(2,3)
Hort 460 Prob. in Landscape Des.	**5**	**(3,6)**	Minor‡	6	
Minor‡	**3**		Approved Electives	3	
Approved Electives	**3**				
	17			16	

134 Total Semester Hours

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* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† To be selected from the following, Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

‡ See class adviser for available minors and course requirements.

PRE-VETERINARY MEDICINE

The curriculum in Pre-veterinary Medicine is designed to meet the general requirements for admission to certain schools of veterinary medicine. Since the requirements for entrance to these schools are not uniform, the student in planning his program should consider the specific requirements of the school he expects to attend. Under the Southern Regional Educational Plan, ten qualified students from South Carolina may enter the College of Veterinary Medicine at the University of Georgia each year. Under the provisions of the compact, these students are exempt from out-of-state charges while studying Veterinary Medicine at the University of Georgia.

Students enrolled in the Pre-veterinary Medicine curriculum have a choice of one of three options: (1) apply for admission to the College of Veterinary Medicine after completion of the first two years of the curriculum. Only the exceptional student is accepted with a minimum of two years of college training; (2) apply for admission to the College of Veterinary Medicine after completion of the three-year Pre-veterinary curriculum; (3) upon completion of the three-year Pre-veterinary curriculum, the student may transfer to a major at Clemson University in Animal Science, Dairy Science, Poultry Science, or Zoology and complete the requirements for a Bachelor of Science degree with one additional year's work. Curriculum requirements for Pre-veterinary Medicine transfer students to majors in Animal Science, Dairy Science, and Poultry Science are listed below. (See page 228 for Zoology requirements.)

PRE-VETERINARY MEDICINE CURRICULUM

FOR MAJORS IN ANIMAL SCIENCE, DAIRY SCIENCE, AND POULTRY SCIENCE

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Agric 201 Introd. to Animal Ind.	3	(2,3)
Ch 101 Gen. Chemistry	4	(3,3)	Bot 102 Prin. of Botany	2	(2,0)
Engl 101 English Composition	3	(3,0)	Ch 112 Gen. Chemistry	4	(3,3)
Math 106 Cal. of One Var.	4	(5,0)	Engl 102 English Composition	3	(3,0)
Social Science Elective†	3	(3,0)	Zool 102 Prin. of Zoology	2	(2,0)
AS or MS or Elective	1		Zool 104 Lab. Exer. in Zoology	1	(0,2)
			Social Science Elective†	3	(3,0)
			AS or MS or Elective	1	
	18			19	

PRE-VETERINARY MEDICINE CURRICULUM

ANIMAL SCIENCE MAJOR

(See *Freshman Year* above)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Ch 224 Org. Chemistry	3	(3,0)
Ch 223 Org. Chemistry	3	(3,0)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Gen 302 Genetics	4	(3,3)
History–Literature Requirement*	3	(3,0)	History–Literature Requirement*	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	Nutr 201 Introd. to Nutrition	3	(3,0)
Social Science Elective†	3	(3,0)	Phys 208 Gen. Physics	4	(3,2)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			19	

JUNIOR YEAR

An Sc 301 Feeds and Feeding	3	(3,0)	An Sc 303 Feeds and Feed. Lab.	1	(0,3)
An Sc 353 Meats	2	(2,0)	An Sc 306 Livestock Selection and Evaluation	2	(1,3)
An Sc 355 Meats Laboratory	1	(0,3)	An Sc 406 Seminar	2	(2,0)
An Sc 401 Beef Production	3	(3,0)	An Sc 408 Pork Production	3	(3,0)
An Sc 403 Beef Production Lab.	1	(0,3)	An Sc 410 Pork Production Lab.	1	(0,3)
Dy Sc 453 Animal Reproduction	3	(3,0)	An Sc 452 Animal Breeding	3	(3,0)
Zool 301 Comp. Vert. Anat.	3	(2,3)	Engl 301 Public Speaking	3	(3,0)
	16			15	

SENIOR YEAR

(See class adviser for course requirements)

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* One course to be selected from each of the following groups. (At least one literature course is required.)

Group I: Engl 203, 205, 207, 231, Hist 171, 172.

Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† To be selected from Econ 201, Hist 101, 102, Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

PRE-VETERINARY MEDICINE CURRICULUM

DAIRY SCIENCE MAJOR

(See page 133 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Agric 202 Introd. to Plant Sciences	3	(2,3)	Ch 224 Org. Chemistry	3	(3,0)
or Dy Sc 307 Market Milk	3	(2,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Ch 223 Org. Chemistry	3	(3,0)	Gen 302 Genetics	4	(3,3)
Ch 227 Org. Chemistry Lab.	1	(0,3)	History–Literature Requirement[*]	3	(3,0)
History–Literature Requirement[*]	3	(3,0)	Nutr 201 Introd. to Nutrition	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Social Science Elective[§]	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	18			19	

JUNIOR YEAR

Dy Sc 307 Market Milk	3	(2,3)	Agron 202 Soils	3	(2,2)
or Agric 202 Introd. to Plant Sci.	3	(2,3)	An Sc 301 Feeds and Feeding	3	(3,0)
Dy Sc 453 Animal Reproduction	3	(3,0)	Dy Sc 306 Chemical and Physical Nature of Milk	3	(2,3)
Dy Sc 455 Animal Reproduc. Lab.	1	(0,3)	Approved Electives[‡]	6	
Micro 305 Gen. Microbiology	4	(3,3)			
Approved Electives[†]	6				
	17			15	

SENIOR YEAR

(See class adviser for course requirements)

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[*] One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

[†] Select 3 credits from the following: Fd Sc 305, Dy Sc 310, 409.

[‡] Select 6 credits from the following: Fd Sc 414, Dy Sc 402, 404, 410, 452, Micro 402.

[§] To be selected from Econ 201, Hist 101, 102, Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

PRE-VETERINARY MEDICINE CURRICULUM

POULTRY SCIENCE MAJOR

(See page 133 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Org. Chemistry	3	(3,0)	Ch 224 Org. Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Gen 302 Genetics	4	(3,3)	History–Literature Requirement[*]	3	(3,0)
History–Literature Requirement[*]	3	(3,0)	Nutr 201 Introd. to Nutrition	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Social Science Elective[†]	3	(3,0)	PS 359 Mgt. of Egg, Broiler, and Turkey Enterprises	3	(2,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	19			18	

JUNIOR YEAR

An Sc 301 Feeds and Feeding	3	(3,0)	Agric 202 Introd. to Plant Sciences	3	(2,3)
Micro 305 Gen. Microbiology	4	(3,3)	Engl 301 Public Speaking	3	(3,0)
PS 355 Poultry Products Grading and Technology	3	(2,3)	PS 352 Breeder Flock and Hatchery Management	3	(3,0)
PS 401 Animal Envir. Technology	2	(2,0)	PS 353 Breeder Flock and Hatchery Management Lab.	1	(0,3)
PS 403 Animal Envir. Tech. Lab.	1	(0,3)	PS 451 Poultry Nutrition	2	(2,0)
PS 458 Avian Micro. and Parasit.	4	(3,3)	PS 460 Seminar	2	(2,0)
			Zool 301 Comp. Vert. Anat.	3	(2,3)
	17			17	

SENIOR YEAR

(See class adviser for course requirements)

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[*] One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.

[†] To be selected from Econ 201, Hist 101, 102, Phil 201, Pol Sc 301, Psych 201, RS 301, 401, Soc 201.

COLLEGE OF ARCHITECTURE

The Clemson University College of Architecture provides coordinated pre-professional and professional degree programs at undergraduate and graduate levels in preparation for careers in Architecture, City and Regional Planning, Visual Studies, and Building Construction. These curriculums are not offered elsewhere in the state. The pre-professional offerings of the College also provide an excellent basis for graduate studies in Landscape Architecture and Art and Architectural History.

In addition to the courses and curriculums structured for the professional students of the College, cultural offerings in both lecture and studio courses are available to the general student population and required in certain other schools and colleges.

A rich annual series of exhibitions in the Rudolph Lee Gallery of the College and lectures by figures of international importance in the environmental arts and sciences are presented by the Clemson Architectural Foundation and open to the public. An unusual bond has existed between the architects of the state and region and the College since the first offering of architectural courses to a few students in 1914. The South Carolina Chapter of the American Institute of Architects in 1955 asked that a strong school be established and pledged its continuing unified support of school programs as the prime project of the organization. Sweeping administrative and curricular changes brought a five-year curriculum and full accreditation that year. Following three years of rapid development the College was made an autonomous professional school by action of the Board of Trustees in 1958.

During the decade just ending, the College has sought to select its students with increasing care and to broaden and strengthen its offerings and its faculty. As might be expected, the curriculums and objectives are under continuing study.

To better prepare professional students, a two-degree six-year program is required for those majoring in architecture.

The College enjoys contracts for creative research in several areas, and receives an annual support budget from the Clemson Architectural Foundation to enrich its program. It is a member of the Association of Collegiate Schools of Architecture, the Associated Schools of Construction, collaborates with the South Carolina Chapter of the American Institute of Planners, and is accredited by the

National Architectural Accrediting Board, and the Association of Collegiate Schools of Planning.

The Architectural Foundation, a nonprofit corporation, was established in January 1956 under the Laws of the State of South Carolina and under the sponsorship of the South Carolina Chapter of the American Institute of Architects to facilitate the continuous improvement of architectural education and of the art and technology of building in South Carolina by providing financial and other assistance to the College of Architecture at Clemson University. By this means students in the College of Architecture at Clemson have been able to enjoy instruction, facilities, and conditions of superior quality.

The advantages to the student evolving from the Clemson Architectural Foundation are many. Among them are the programs of celebrated guest critics and lecturers, excellent exhibits of many types—paintings, sculpture, architecture, construction, furniture, ceramics, textiles and other allied arts and crafts—traveling expenses for student field trips and professional activities, and student loans and grants. Visual-aid facilities and gifts to the library are examples of permanent assets provided through Foundation support.

Intangible but important is the sense of unity and of high purpose resulting from the activities of the Clemson Architectural Foundation which now permeates the entire architectural scene in South Carolina: the architects, their friends in the building industry and the faculty of the College.

The College of Architecture is housed in a modern building constructed for its program in 1958. Space, nevertheless, is limited and enrollment restricted to students with capacity and motivation. A major addition to the building is projected for completion by 1973. At present the requisite functions are provided on two levels arranged around a central landscaped court. Design studios and the library occupy the entire second level. The first level accommodates the auditorium, classrooms, two art studios, the Exhibition Gallery, and administrative and faculty offices. A ground floor houses shops, photo laboratory, and sculpture studio, jury room and gallery preparations and storage. All areas are air-conditioned.

ENTRANCE REQUIREMENTS

In the interest of both students and the conservation of University resources and to maintain a program on the highest level, admission to the College of Architecture must necessarily be on a selective basis. Annual enrollment quotas are established consistent with space available. Selection considerations include secondary school record and performances in the College Board examination (SAT Test.) A personal interview with the Dean or Department Head should be arranged by the applicant as early as possible in the year before admission.

Applicants for Architecture are required to take the Architectural Aptitude Examination as administered by the Educational Testing Service of Princeton, and although these are not used as criterion for admission, the results are helpful to both the applicant and the admission committee.

Applications for the Aptitude Examination may be obtained from the Educational Testing Service, Princeton, New Jersey 20933. This test is administered at Clemson and other regional testing centers in October, January, and March.

Students wishing admission are advised to make application to the University early in the fall or winter of their senior year in high school and to make arrangements for a personal interview with the Dean of the College as soon as possible. The Admissions Council of the College will further interview entering students during freshman matriculation week of each academic year.

THE PROGRAMS OF STUDY

Architecture

The architect as a practicing professional has the creative responsibility of designing the buildings which shape our physical environment. To understand the humanistic, economic and technological nature of environmental problems, he must have a sound general education. This professional education must prepare him for a life of continuing change, in which problems to be solved will be large and small, for every sort of function, in every type of climate and for every condition of budget.

The curriculum in architecture is six years in length, embracing both a four-year Bachelor of Arts in Pre-architecture program and a four-year Bachelor of Science in Pre-architecture sequence, with a balance of general education and professional study followed by two intensive years of graduate work leading to the first professional degree, Master of Architecture.

BUILDING CONSTRUCTION

The nation's leading industry in terms of annual dollar volume is Building Construction. Building contracting is a dynamic field and although organizations vary considerably in type, size and complexity, those in leadership positions must invariably have capability (education) in management, construction science, relevant technical disciplines, and the humanities. The curriculum in Building Construction has been structured to provide young people with the unique balance of studies needed to equip them for key roles in the industry. There is a tremendous demand for graduates of the curriculum. The course is four years in length and leads to the Bachelor of Science degree in Building Construction.

CITY AND REGIONAL PLANNING

The City Planner is a member of an essential and complex profession concerned with the programming and guiding of urban and regional development. Our expanding society presents unusual opportunities for Planning graduates in private firms and on public agency staffs. When asked what made a good planner, a leading British professional replied, "A sensitive, creative leader who has lived a bit." He must be able to integrate recommendations of a wide range of specialists. The sociologist, economist, traffic engineer and ecologist, plays significant roles in urban growth and change, but the city planner and urban designer must bring the city to physical form with balance and imagination.

Students admitted as candidates for the Master of City and Regional Planning degree must have the following qualifications:

(a) Meet the admissions requirements for the University Graduate School.

(b) Have a baccalaureate degree approved by the school in such fields as: architecture, civil engineering, economics, landscape architecture, law, political science, or sociology.

Candidates entering the curriculum from a nondesign discipline will be required to take a special parallel course designed for their needs, and accordingly may be excused from courses in which they have achieved proficiency.

HISTORY AND VISUAL STUDIES

The Department of History and Visual Studies provides required undergraduate courses in architectural and art history and visual arts. The Department also offers a two-year graduate program leading to the Master of Fine Arts degree in Ceramics, Painting, Sculpture, Printmaking, Graphic Design, Photography, and Multimedia. The graduate curricula have an emphasis in creative professional work of high standard. Maximum flexibility is provided in the management of these courses to foster innovation and imaginative solutions to fine arts problems.

PRE-ARCHITECTURE CURRICULUM

BACHELOR OF ARTS IN PRE-ARCHITECTURE

FIRST YEAR

First Semester		*Second Semester*	
Arch 101 Arch. Analysis	3 (1,6)	Arch 102 Arch. Analysis	3 (1,6)
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Math 103 College Algebra	2 (3,0)	Math 106 Cal. of One Var.	4 (5,0)
Math 104 Trigonometry	2 (3,0)	Modern Language (Elementary)	4 (3,1)
Modern Language (Elementary)	4 (3,1)	Elective	3
Elective	3		
	17		17

SECOND YEAR

AAH 215 Arch. History I	3 (3,0)	AAH 216 Arch. History II	3 (3,0)
Arch 253 Arch. Design I	5(0,15)	Arch 254 Arch. Design II	5(0,15)
BldSc 201 Building Science I	3 (3,0)	BldSc 202 Building Science II	3 (3,0)
Modern Language (Intermediate)	3 (3,0)	Modern Language (Intermediate)	3 (3,0)
Vis 203 Vis. Arts Studio	3 (1,6)	Visual Studies*	3 (1,6)
	17		17

THIRD YEAR

AAH 315 Arch. History III	3 (3,0)	AAH 316 Arch. History IV	3 (3,0)
Arch 353 Arch. Design III	5(0,15)	Arch 354 Arch. Design IV	5(0,15)
BldSc 301 Building Science III	3 (3,0)	BldSc 302 Building Science IV	3 (3,0)
Elective	6	Elective	6
	17		17

FOURTH YEAR

Arch 421 Arch. Seminar	2 (2,0)	Arch 422 Arch. Seminar	2 (2,0)
Arch 453 Arch. Design V	5(0,15)	Arch 454 Arch. Design VI	5(0,15)
BldSc 401 Building Science V	4 (3,3)	BldSc 402 Building Science VI	4 (3,3)
Elective	6	Elective	6
	17		17

136 Total Semester Hours

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* Vis 205, 207, 209, 211, 213, 215, 217.

Elective Policy:

Major: To fulfill requirements for a major in Pre-architecture students must take, in addition to specified courses, a minimum of 9 credits above the sophomore level in areas of Art and Architectural History, Building Science, City and Regional Planning, Architectural Design, or Visual Studies.

Military and Air Science: A maximum of 4 elective credits may be earned in basic military or air science and a maximum of 6 elective credits may be earned in advanced military or air science.

English Literature: A minimum of 6 elective credits are required in the area of literature.

Minor Concentration: Students should select, no later than the end of their sophomore year, a minor field of concentration from the following areas: English, Mathematics, Modern Language, Philosophy, Life Sciences, Physical Sciences, Social Sciences. The minor concentration requires a total of 15 credits with at least 3 credits above the sophomore level. A minor may include specified courses.

PRE-ARCHITECTURE CURRICULUM

BACHELOR OF SCIENCE IN PRE-ARCHITECTURE

FIRST YEAR

First Semester		*Second Semester*	
Arch 101 Arch. Analysis	3 (1,6)	Arch 102 Arch. Analysis	3 (1,6)
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Math 106 Cal. of One Var.	4 (5,0)	Math 108 Cal. and Lin. Alg.	4 (5,0)
Phys 115 Classical Phys. I	3 (3,0)	Phys 116 Classical Phys. II	3 (3,0)
Elective	3	Elective	3
	16		16

SECOND YEAR

AAH 215 Arch. History I	3 (3,0)	AAH 216 Arch. History II	3 (3,0)
Arch 253 Arch. Design I	5(0,15)	Arch 254 Arch. Design II	5(0,15)
BldSc 201 Building Science I	3 (3,0)	BldSc 202 Building Science II	3 (3,0)
Econ 201 Prin. of Economics	3 (3,0)	Econ 202 Prin. of Economics	3 (3,0)
Vis 203 Vis. Arts Studio	3 (1,6)	Visual Studies*	3 (1,6)
	17		17

THIRD YEAR

AAH 315 Arch. History III	3 (3,0)	AAH 316 Arch. History IV	3 (3,0)
Arch 353 Arch. Design III	5(0,15)	Arch 354 Arch. Design IV	5(0,15)
BldSc 301 Building Science III	3 (3,0)	BldSc 302 Building Science IV	3 (3,0)
Elective	6	Elective	6
	17		17

FOURTH YEAR

Arch 421 Arch. Seminar	2 (2,0)	Arch 422 Arch. Seminar	2 (2,0)
Arch 453 Arch. Design V	5(0,15)	Arch 454 Arch. Design VI	5(0,15)
BldSc 401 Building Science V	4 (3,3)	BldSc 402 Building Science VI	4 (3,3)
Elective	6	Elective	6
	17		17

134 Total Semester Hours

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* Vis 205, 207, 209, 211, 213, 215, 217.

Elective Policy:

Major: To fulfill requirements for a major in Pre-architecture students must take, in addition to specified courses, a minimum of 9 credits above the sophomore level in areas of Art and Architectural History, Building Science, City and Regional Planning, Architectural Design, or Visual Studies.

Military and Air Science: A maximum of 4 elective credits may be earned in basic military or air science and a maximum of 6 elective credits may be earned in advanced military or air science.

English Literature: A minimum of 6 elective credits are required in the area of literature.

Minor Concentration: Students should select, no later than the end of their sophomore year, a minor field of concentration from the following areas: English, Mathematics, Modern Language, Philosophy, Life Sciences, Physical Sciences, Social Sciences. The minor concentration requires a total of 15 credits with at least 3 credits above the sophomore level. A minor may include specified courses.

BUILDING CONSTRUCTION CURRICULUM

BACHELOR OF SCIENCE IN BUILDING CONSTRUCTION

FIRST YEAR

First Semester			*Second Semester*		
Arch 101 Arch. Analysis	3	(1,6)	Arch 102 Arch. Analysis	3	(1,6)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Phys 115 Classical Phys. I	3	(3,0)	Phys 116 Classical Phys. II	3	(3,0)
Elective	3		Elective	3	
	16			16	

SECOND YEAR

AAH 215 Arch. History I	3	(3,0)	AAH 216 Arch. History II	3	(3,0)
Acct 201 Prin. of Accounting	3	(3,0)	Acct 202 Prin. of Accounting	3	(3,0)
BldSc 201 Building Science I	3	(3,0)	BldSc 202 Building Science II	3	(3,0)
BldSc 241 Construction Org. and Estimating	5	(2,9)	BldSc 242 Construction Planning and Scheduling	5	(2,9)
Econ 201 Prin. of Economics	3	(3,0)	Econ 202 Prin. of Economics	3	(3,0)
	17			17	

THIRD YEAR

AAH 315 Arch. History III	3	(3,0)	AAH 316 Arch. History IV	3	(3,0)
BldSc 301 Building Science III	3	(3,0)	BldSc 302 Building Science IV	3	(3,0)
BldSc 341 Construction Data Systems	5	(2,9)	BldSc 342 Construction Labor Management	5	(2,9)
CE 201 Surveying	3	(2,3)	IM 312 Commercial Law	3	(3,0)
Elective	3		Elective	3	
	17			17	

FOURTH YEAR

Arch 421 Arch. Seminar	2	(2,0)	Arch 422 Arch. Seminar	2	(2,0)
BldSc 401 Building Science V	4	(3,3)	BldSc 402 Building Science VI	4	(3,3)
BldSc 441 Construction Econ.	5	(2,9)	BldSc 442 Construction Mgt.	5	(2,9)
Elective	6		Elective	6	
	17			17	

134 Total Semester Hours

Elective Policy:

Major: To fulfill the requirements for a major in Building Construction students must take, in addition to specified courses, a minimum of 8 credits above the sophomore level in the area of Accounting, Economics, Industrial Management, Building Science, or Planning Studies.

Military and Air Science: A maximum of 4 elective credits may be earned in basic military or air science and a maximum of 6 elective credits may be earned in advanced military or air science.

English: A minimum of 6 elective credits are required in the area of literature and oral expression.

COLLEGE OF EDUCATION

The purpose of the College of Education is to prepare teachers, special service personnel, and school leaders; to provide professional services to education in South Carolina; and to carry out basic and applied research in education. Curriculums are organized to give students the opportunities to (1) acquire a broad general education through liberal arts and science courses; (2) develop depth of knowledge in the teaching area; (3) gain an understanding of the historical, philosophical and psychological backgrounds of American Education; and (4) acquire knowledge of and skill and experience in using effective teaching techniques.

Curriculums for those preparing to teach have been especially designed by committees from each department offering a teaching major and the College of Education. The Clemson University Teacher Education Committee, composed of representatives from the teaching-major departments and public schools, serves in a curriculum advisory capacity to the Dean of the College of Education.

The College of Education offers courses in Aerospace Studies, Agricultural Education, Early Childhood Education, Elementary Education, Industrial Education, Military Science, and Secondary Education.

Programs leading to the Bachelor of Science degree are available in Agricultural Education, Industrial Education, and Science Teaching (Biological Sciences, Chemistry, Earth Science, Physical Sciences, or Mathematics). Students preparing to teach in these fields should register as freshmen in the appropriate curriculum in the College of Education.

Students preparing to teach Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Political Science, Psychology, or Sociology should register in the Bachelor of Arts program in Secondary Education. Those preparing for the elementary level should register for the Bachelor of Arts program in Elementary Education or in Early Childhood Education.

Any student who has been admitted to the University and who is eligible for continuing enrollment may be admitted to the College of Education. However, admission to specific curriculums is selective and requires meeting established criteria. Students who transfer to the College of Education as upperclassmen will be required to meet all the basic requirements for admission to that Education curriculum.

Application to a specific curriculum should be made to the office of the Dean or to the department concerned during the semester preceding that in which the student wishes to obtain admission. Completion of Sc Ed Form 01 and a personal interview are required as part of the application to a specific teacher education curriculum. Sc Ed Form 02, Application for Directed Teaching, should be filed with the faculty adviser no later than May 1 preceding the school year in which student teaching is to be scheduled.

Directed Teaching is on a "block schedule." The other three classes are scheduled to meet during the first half of the semester, and Directed Teaching is scheduled for the last half.

Qualified students who complete a minimum of six semester hours in junior-senior honors courses in Education and a minimum of six semester hours of honors courses in the teaching field may graduate with Departmental Honors.

A student completing at least six semester hours in junior-senior honors courses in Education and a minimum of six semester hours of junior and senior honors courses outside the teaching area may graduate with Senior Division Honors.

BACHELOR OF ARTS CURRICULUMS

EARLY CHILDHOOD EDUCATION

The curriculum in Early Childhood Education leads to a Bachelor of Arts degree in Early Childhood Education. It prepares students for teaching positions in kindergarten or grades 1-3. A minimum of 132 semester hours is required for graduation.

Application to Directed Teaching (Ed 484) should be made in writing no later than May 1 prior to the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

EARLY CHILDHOOD EDUCATION CURRICULUM

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 102 American History	3 (3,0)
Hist 101 American History	3 (3,0)	Math 116 Contemporary Math. for Elementary Teachers II	3 (3,0)
Math 115 Contemporary Math. for Elementary Teachers I	3 (3,0)	Modern Language	4 (3,1)
Modern Language	4 (3,1)	Science‡	3 — 4
Science‡	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		
	18 — 19		17 — 18

SOPHOMORE YEAR

First Semester			*Second Semester*		
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 215 Algebra for Elem. Teach.	3	(3,0)	Math 216 Geom. for Elem. Teach.	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science‡	4 — 3		Science‡	4 — 3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 334 Child Growth & Devel.	3	(3,0)
Ed 302 Educational Psychology	3	(3,0)	Ed 459 Fund. of Basic Reading	3	(3,0)
Engl 351 Children's Literature	3	(3,0)	Hist 313 History of S. C.	3	(3,0)
In Ed 372 Arts and Crafts	3	(2,3)	Social Science Elective†	3	
Mus 400 Music in Elementary School Classroom	3	(3,0)	Electives	3	
Social Science Elective†	3			15	
	18				

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 336 Behavior Preschool Child.	3	(2,2)	Ed 483 Methods and Materials for Early Childhood Ed.	3	(3,0)
Ed 461 Teaching Read. in Elem.	3	(3,0)	Ed 484 Directed Teaching	6	(1,15)
Ed 466 Cur. for Early Child. Ed.	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Elective	3				
	15			15	

132 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Economics, Political Science, Sociology, Philosophy, Religion, Geography.

‡ Must include Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in Chemistry, Geology, Physics, or Physical Science.

ELEMENTARY EDUCATION

The curriculum in Elementary Education leads to a Bachelor of Arts degree in Elementary Education. It prepares students for teaching positions on the elementary level. Provisions are made for more detailed study in an instructional interest area. A minimum of 132 semester hours is required for graduation.

Application to Directed Teaching (Ed 481) should be made in writing no later than May 1 prior to the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

ELEMENTARY EDUCATION CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 102 American History	3	(3,0)
Hist 101 American History	3	(3,0)	Math 116 Contemporary Math. for Elementary Teachers II	3	(3,0)
Math 115 Contemporary Math. for Elementary Teachers I	3	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Science‡	3 — 4	
Science‡	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1			17 — 18	
	18 — 19				

Sophomore Year

First Semester			*Second Semester*		
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 215 Algebra for Elem. Teach.	3	(3,0)	Math 216 Geom. for Elem. Teach.	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science‡	4 — 3		Science‡	4 — 3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

Junior Year

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Engl 351 Children's Literature	3	(3,0)	Hist 313 History of S. C.	3	(3,0)
In Ed 372 Arts and Crafts	3	(2,3)	Social Science Elective†	3	
Mus 400 Music in Elementary	3	(3,0)	Interest Area	3	
Social Science Elective†	3		Electives	3	
Interest Area	3				
	18			15	

Senior Year

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 334 Child Growth & Develop.	3	(3,0)	Ed 481 Directed Teaching	6	(1,15)
Ed 461 Teaching Read. in Elem.	3	(3,0)	Ed 485 Methods and Curriculum in Elem. Math. and Science	3	(3,0)
Interest Area	6		or Ed 486 Methods and Cur. in Elem. Social Studies and Lang. Arts	3	(3,0)
			Mus 210 Music Appreciation	3	(3,0)
	15			15	

132 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Economics, geography, political science, sociology, philosophy, religion.

‡ Must include Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, geology, physics, or physical science.

SECONDARY EDUCATION

Programs leading to a Bachelor of Arts degree in Secondary Education are available to students preparing to teach Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Political Science, Psychology, or Sociology on the secondary school level. The teaching field should be selected as early as possible in order that appropriate freshman and sophomore courses may be taken.

Each curriculum requires a major concentration in the teaching field. Specific courses and sequences have been designated by teacher education committees to meet requirements for those planning to teach. Students who have elective courses in the teaching area should consult the departmental adviser prior to scheduling these courses.

The Professional Education courses should be completed in sequence prior to registering for the block schedule. Application to Directed Teaching (Ed 412) should be made in writing no later than May 1 preceding the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for Directed Teaching.

Education 412 is conducted on a full-day basis, "block schedule," for one-half semester. Students taking Ed 412 will register for Ed 424, 458, and Mus 210, these three courses being taught on a five-day basis during the first half of the semester.

SECONDARY EDUCATION CURRICULUMS

TEACHING AREA: ECONOMICS

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Science[†]	3 — 4	
Science[†]	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	18 — 19			17 — 18	

SOPHOMORE YEAR

Econ 201 Principles of Econ.	3	(3,0)	Acct 201 Prin. of Accounting	3	(3,0)
Literature Requirement[*]	3	(3,0)	Econ 202 Prin. of Economics	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	Literature Requirement[*]	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science[†]	4 — 3		Science[†]	4 — 3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	3	
	15			15	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[‡]	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

129 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

[‡] This semester is a block schedule and must be taken as listed.

Note: The teaching major requires twenty-four semester hours of junior and senior courses consisting of Econ 314, 407; nine semester hours from Econ 302, 403, 404, 410, 412, 420; distributed as follows:

Group A:	Econ 314, 407.
Group B:	Three courses from: Econ 302, 403, 404, 410, 412, 420.
Group C:	The remaining hours selected from Econ 301, 302, 305, 306, 308, 309, 403, 404, 410, 412, 416, 420, 422, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

TEACHING AREA: ENGLISH

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Science§	3 — 4	
Science§	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1				
	15 — 16			14 — 15	

SOPHOMORE YEAR

Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science§	4 — 3		Science§	4 — 3	
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Hist 361 History of England	3	(3,0)	Hist 363 History of England	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	3		Elective	3	
	18			18	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth & Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

129 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Economics, geography, political science, sociology, philosophy, religion.

‡ This semester is a block schedule and must be taken as listed.

§ Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

Note: The teaching major requires twenty-four semester hours of junior and senior English courses, and it must include: Engl 304, 352, 402, 404, 405, 422 or 423, 440 and 461 or 462.

Those receiving departmental certification for Engl 304 are required to complete one additional course on the 400 level.

TEACHING AREA: HISTORY

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 or 173 West. Civilization	3 (3,0)
Hist 171 or 172 West. Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	4 (3,1)
Modern Language	4 (3,1)	Science[§]	3 — 4
Science[§]	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		
	18 — 19		17 — 18

SOPHOMORE YEAR

Hist 101 American History	3 (3,0)	Hist 102 American History	3 (3,0)
Literature Requirement[*]	3 (3,0)	Literature Requirement[*]	3 (3,0)
Modern Language	3 (3,0)	Modern Language	3 (3,0)
Science[§]	4 — 3	Science[§]	4 — 3
Social Science Elective[†]	3 (3,0)	Social Science Elective[†]	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

JUNIOR YEAR

Ed 301 History of American Ed.	3 (3,0)	Ed 302 Educational Psychology	3 (3,0)
Teaching Major	9	Teaching Major	9
Elective	3	Elective	3
	15		15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching[‡]	6(1,15)
Ed 335 Adol. Growth & Dev.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3 (3,0)
Ed 498 Sec. Sch. Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 210 Music Appreciation	3 (3,0)
	15		15

129 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Economics, geography, political science, sociology, philosophy, religion.

[‡] This semester is a block schedule and must be taken as listed.

[§] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

Note: The teaching major requires twenty-four semester hours of junior and senior history courses: Hist 313, and at least one course from Group A, and two courses each from Group B and C.

Group A: Hist 306, 307, 314, 315, 410, 411, 412, 413.
Group B: Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 482, 483, 484.
Group C: Hist 331, 332, 340, 341, 342.

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	**Engl 102 English Composition**	3	(3,0)
Engl 101 English Composition	3	(3,0)	**Math 108 Cal. and Lin. Alg.**	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Science§	3 — 4	
Science§	3 — 4		**AS or MS or Elective**	1	
AS or MS or Elective	1				
	16 — 17			15 — 16	

SOPHOMORE YEAR

Hist 171 or 172 West. Civilization	3	(3,0)	**Hist 172 or 173 West. Civilization**	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	**Math 295 Found. of Analysis**	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science§	4 — 3		Science§	4 — 3	
AS or MS or Elective	1		**Social Science Elective†**	3	(3,0)
			AS or MS or Elective	1	
	18 — 17			20 — 19	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	AAH 303 Evol. of Visual Arts	3	(3,0)
Math 301 Stat. Methods I	3	(3,0)	**Ed 302 Educational Psychology**	3	(3,0)
Math 308 College Geometry	3	(3,0)	**Math 408 Topics in Geom.**	3	(3,0)
Social Science Elective†	3	(3,0)	**Math 411 Linear Alg.**	3	(3,0)
Elective	3		Elective	3	
	15			15	

SENIOR YEAR

(Block Schedule—Either Semester)

Ed 335 Adol. Growth & Dev.	3	(3,0)	**Ed 412 Directed Teaching‡**	6	(1,15)
Ed 498 Sec. Sch. Reading	3	(3,0)	**Ed 424 Meth. & Mat. in Sec. Sch.**	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)	**Ed 458 Health Education**	3	(3,0)
Math Electives	6		**Mus 210 Music Appreciation**	3	(3,0)
	15			15	

129 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Economics, geography, political science, sociology, philosophy, religion.

‡ This semester is a block schedule and must be taken as listed.

§ Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

Note: Suggested Math electives: Math 405, 409, 452, 453, 454, Comp Sc 205, 210.

TEACHING AREA: MODERN LANGUAGES (FRENCH, GERMAN, OR SPANISH)

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Science§	3 — 4	
Science§	3 — 4		AS or MS or Elective	1	
AS or MS or Elective	1			14 — 15	
	15 — 16				

SOPHOMORE YEAR

Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science§	4 — 3		Science§	4 — 3	
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ed 301 History of American Ed.	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Teaching Major	9		Teaching Major	9	
Elective	6		Elective	6	
	18			18	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth and Dev.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. Sch. Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

129 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Economics, geography, political science, sociology, philosophy, religion.

‡ This semester is a block schedule and must be taken as listed.

§ Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

Note: The French teaching major consists of 24 semester hours including Fr 303, 304, 305. Electives from Fr 306, 307, 308, 403, 404, 405, 406, 407, 408.

The German teaching major consists of 24 semester hours including Ger 303, 304, 305. Electives from Span 306, 307, 308, 401, 402, 405, 406.

The Spanish teaching major consists of 24 semester hours including Span 303, 304, 305. Electives from Span 306, 307, 308, 401, 402, 405, 406.

A student desiring to become certified to teach a second Modern Language must complete the third year of the second language.

TEACHING AREA: NATURAL SCIENCES

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Math 102 Math. Anal. II	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	AS or MS or Elective	1	
AS or MS or Elective	1				
	16			15	

Sophomore Year

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Bot 104 Lab. Exer. in Bot.	1	(0,2)
Literature Requirement*	3	(3,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
Modern Language	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Social Science Elective†	3		Literature Requirement*	3	(3,0)
AS or MS or Elective	1		Modern Language	3	(3,0)
			Social Science Elective†	3	
	19		AS or MS or Elective	1	
				16	

Junior Year

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Geol 201 Phys. Geol.	4	(3,3)	Geol 202 Hist. Geol.	4	(3,3)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Elective	3		Elective	3	
Science Elective§	3		Science Elective§	3	
	17			17	

Senior Year

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Astr 205 Descriptive Astronomy	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Science Elective§	3			15	
	15		130 Total Semester Hours		

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Economics, geography, political science, sociology, philosophy, religion.

‡ The last semester of the senior year is a block schedule and must be taken as listed.

§ Science electives to be taken in biological sciences, chemistry, physics, geology.

TEACHING AREA: POLITICAL SCIENCE

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 or 173 West. Civilization	3 (3,0)
Hist 171 or 172 West. Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	4 (3,1)
Modern Language	4 (3,1)	Science[†]	3 — 4
Science[†]	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		17 — 18
	18 — 19		

SOPHOMORE YEAR

Hist 101 American History	3 (3,0)	Hist 102 American History	3 (3,0)
Literature Requirement[*]	3 (3,0)	Literature Requirement[*]	3 (3,0)
Modern Language	3 (3,0)	Modern Language	3 (3,0)
Pol Sc 101 Introd. to Pol. Sci. I	3 (3,0)	Pol Sc 201 Introd. to Pol. Sci. II	3 (3,0)
Science[†]	4 — 3	Science[†]	4 — 3
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3 (3,0)	Ed 302 Ed. Psychology	3 (3,0)
Teaching Major	9	Teaching Major	9
Elective	3	Elective	3
	15		15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching[‡]	6(1,15)
Ed 335 Adol. Growth & Develop.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3 (3,0)
Ed 498 Sec. School Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 210 Music Appreciation	3 (3,0)
	15		15

129 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Biol 102, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or Phy Sc 101, 102.

[‡] This semester is a block schedule and must be taken as listed.

Note: The teaching major requires twenty-four semester hours of junior and senior Political Science courses.

Pol Sc 101, 201, and 302, plus 21 semester hours in courses drawn from four of the following fields, including one course in comparative government:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433, 434
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372 (Recommended)

TEACHING AREA: PSYCHOLOGY

FRESHMAN YEAR

First Semester			*Second Semester*		
Ed 100 Orientation	1	(1,0)	**Engl 102 Engl. Composition**	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	**Math 102 Math. Anal. II**	3	(3,0)
Math 101 Math. Anal. I	3	(3,0)	**Modern Language**	4	(3,1)
Modern Language	4	(3,1)	Science[§]	3 — 4	
Science[§]	3 — 4		**AS or MS or Elective**	1	
AS or MS or Elective	1				
	18 — 19			17 — 18	

SOPHOMORE YEAR

Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	Modern Language	3	(3,0)
Modern Language	3	(3,0)	Psych 202 Introd. Exp. Psych.	3	(3,0)
Psych 201 General Psychology	3	(3,0)	Science[§]	4 — 3	
Science[§]	4 — 3		**Social Science Elective[†]**	3	(3,0)
AS or MS or Elective	1		**AS or MS or Elective**	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Ed. Psychology	3	(3,0)
Teaching Major	9		Teaching Major	6	
Elective	3		Social Science Elective[†]	3	(3,0)
			Elective	3	
	15			15	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[‡]	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Teaching Major	6		Mus 210 Music Appreciation	3	(3,0)
	15			15	

129 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Economics, geography, philosophy, political science, religion, sociology.

[‡] This semester is a block schedule and must be taken as listed.

[§] Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

Note: The teaching major requires 24 semester hours of junior and senior courses selected from Psych 302, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 490, 498, Ed 302, 335 (Ed 302 is counted in the teaching area).

TEACHING AREA: SOCIOLOGY

FRESHMAN YEAR

First Semester		*Second Semester*	
Ed 100 Orientation	1 (1,0)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Hist 172 or 173 West. Civilization	3 (3,0)
Hist 171 or 172 West. Civilization	3 (3,0)	Math 102 Math. Anal. II	3 (3,0)
Math 101 Math. Anal. I	3 (3,0)	Modern Language	4 (3,1)
Modern Language	4 (3,1)	Science§	3 — 4
Science§	3 — 4	AS or MS or Elective	1
AS or MS or Elective	1		17 — 18
	18 — 19		

SOPHOMORE YEAR

Literature Requirement*	3 (3,0)	Literature Requirement*	3 (3,0)
Math 203 Elem. Stat. Infer.	3 (3,0)	Modern Language	3 (3,0)
Modern Language	3 (3,0)	Soc 202 Social Problems	3 (3,0)
Soc 201 Introductory Soc.	3 (3,0)	Science§	4 — 3
Science§	4 — 3	Elective†	3
AS or MS or Elective	1	AS or MS or Elective	1
	17 — 16		17 — 16

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3 (3,0)	Ed 302 Ed. Psychology	3 (3,0)
Teaching Major	9	Teaching Major	9
Elective†	6	Elective†	3
	18		15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3 (3,0)	Ed 412 Directed Teaching‡	6(1,15)
Ed 335 Adol. Growth & Develop.	3 (3,0)	Ed 424 Meth. & Mat. in Sec. Schs.	3 (3,0)
Ed 498 Sec. School Reading	3 (3,0)	Ed 458 Health Education	3 (3,0)
Teaching Major	6	Mus 210 Music Appreciation	3 (3,0)
Elective†	2		15
	17		

134 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Electives must include Econ 201, 202, Phil 201, 302, Pol Sc 301.

‡ This semester is a block schedule and must be taken as listed.

§ Biol 101, Bot 102, 104, or Zool 102, 104, and a two-semester sequence in chemistry, physics, geology, or physical science.

Note: The teaching major consists of Soc 411, 421, and the remaining from Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 431, 441, 451, 481, 499.

BACHELOR OF SCIENCE CURRICULUMS

AGRICULTURAL EDUCATION ‡

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations, and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations and agricultural extension; farming, soil conservation and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in business or international agriculture or in one subject-matter field. Students in other departments may minor in Agricultural Education and be certified to teach.

AGRICULTURAL EDUCATION CURRICULUM ‡

FRESHMAN YEAR

First Semester			*Second Semester*		
Agric 101 Introd. to Agric.	1	(1,0)	Bot 102 Prin. of Botany	2	(2,0)
Biol 101 Prin. of Biology	3	(3,0)	Bot 104 Lab. Exercises in Bot.	1	(0,2)
Ch 101 General Chemistry	4	(3,3)	or Zool 104 Lab. Exer. in Zool.	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,3)
Hist 102 American History	3	(3,0)	or Ch 112 Gen. Chemistry	4	(3,3)
Math 103 College Algebra	2	(3,0)	Engl 102 English Composition	3	(3,0)
AS or MS or Elective	1		Math 104 Trigonometry	2	(3,0)
	17		Zool 102 Prin. of Zoology	2	(2,0)
			AS or MS or Elective	1	
				15	

SOPHOMORE YEAR

Ag Ed 201 Introd. to Agric. Ed.	3	(2,2)	AgE 205 Farm Shop	3	(2,3)
Agric 202 Introd. to Plant Sciences	3	(2,3)	AgE 206 Agric. Mechanization	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	Agric 201 Introd. to Animal Ind.	3	(2,3)
History–Literature Requirement*	3	(3,0)	Agron 202 Soils	3	(2,2)
Phys 207 Gen. Physics	4	(3,2)	History–Literature Requirement*	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

AgE 301 Soil and Water Conserva.	3	(2,3)	Ag Ec 302 Agric. Firm Mgt.	3	(2,3)
Agron 301 Fertilizers	3	(3,0)	An Sc 301 Feeds and Feeding	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	For 305 Elements of Forestry	2	(2,0)
Approved Horticulture Elective	3		For 307 Elem. of Forestry Lab.	1	(0,3)
Minor†	3		Minor†	9	
Approved Electives	3			18	
	18				

SENIOR YEAR

First Semester		*Second Semester*	
Ag Ec 452 Agric. Policy	3 (3,0)	Ag Ed 401 Methods in Agric. Education	3 (2,2)
Ent 301 General Entomology	3 (2,3)	Ag Ed 406 Directed Teaching	6(0,18)
Hort 407 Landscape Design	3 (2,3)	Ag Ed 422 Introd. to Adult Ed.	3 (2,2)
Pl Pa 401 Plant Pathology	3 (2,3)	Ed 302 Education Psychology	3 (3,0)
Minor†	3		
Approved Electives[*]	3		15
	18		

134 Total Semester Hours

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[*] One course to be selected from each of the following groups. (At least one literature course is required.)

Group I: Engl 203, 205, 207, 231, Hist 171, 172.

Group II: Engl 204, 206, 208, 231, Hist 172, 173.

† See class adviser for available minors and course requirements.

‡ Jointly administered by the College of Education and the College of Agricultural Sciences.

INDUSTRIAL EDUCATION

The curriculum in Industrial Education is designed to prepare students for careers in the teaching of industrial subjects and in training programs in industry. To accomplish these purposes the curriculum is divided into three areas of specialization leading to the degree of Bachelor of Science in Industrial Education. At the end of his freshman year, each student will select one of three options: Industrial Arts Education, Vocational-Technical Education, or Education for Industry. Each option requires 135 semester hours of course work.

The Industrial Arts Education option is for those students who desire to teach industrial arts in the secondary schools. Industrial arts is the subject area in the public school system which attempts to provide youth with an interpretation of American industry. It is a general education subject designed to give students exploratory experience in the classroom and laboratory. Majors in this option are qualified for full certification as secondary school teachers of industrial arts.

The Vocational-Technical Education option is designed to prepare teachers of vocational and technical subjects in the Senior High Schools, Area Vocational Schools, and Technical Education Centers. All elective courses in this option will be in an area of specialization or related fields. Teachers graduating from this option will possess the skills and knowledge required to teach the occupation or family of occupation in their area of specialization.

The Education for Industry option is designed to prepare students to enter industry as training specialists. Due to the expansion of technology and industrial development, there is a rapidly increasing demand for training specialists and training directors in industry.

EDUCATION FOR INDUSTRY OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to Ind. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math. Analysis I	3	(3,0)	Math 102 Math. Analysis II	3	(3,0)
Science Elective§	4	(3,3)	Science Elective§	4	(3,3)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

SOPHOMORE YEAR

EG 201 Engr. Graph. for Ind. Ed.	3	(1,6)	Econ 201 Principles of Econ.	3	(3,0)
In Ed 203 Basic Metal Processes	3	(1,6)	In Ed 204 Graphic Arts	3	(1,6)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Psych 201 Gen. Psychology	3	(3,0)
Science Elective§	4	(3,3)	Elective	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

Econ 301 Economics of Labor	3	(3,0)	IE 303 Job Evaluation	3	(3,0)
Ed 302 Ed. Psychology	3	(3,0)	IM 415 Managerial Dec. Making	3	(3,0)
IM 307 Personnel Management	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 325 Ind. Org. & People	3	(3,0)
In Ed 303 Electricity	3	(1,6)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Approved Elective‡	3	(3,0)	Approved Elective‡	3	(3,0)
	17			18	

SENIOR YEAR

Engl 301 Public Speaking	3	(3,0)	In Ed 496 Pub. Relations	3	(3,0)
IM 408 Work Simp. & Std.	3	(3,0)	Soc 351 Ind. Soc.	3	(3,0)
In Ed 405 Course Org. & Eval.	3	(3,0)	Approved Elective‡	12	
In Ed 408 Train. Prog. in Ind.	3	(3,0)			
Text 460 Textile Processes	3	(3,0)			
Approved Elective‡	3				
	18			18	

135 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Social Science electives to be selected from history, sociology, economics, political science, religion, or philosophy.

‡ See class adviser for list of elective courses.

§ Science electives to be selected from chemistry, physics, geology, physical science, biology, botany, or zoology. At least two fields must be represented.

Note: One summer (400 clock hours) of field experience is required of each student following the completion of his sophomore year.

INDUSTRIAL ARTS EDUCATION OPTION

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
In Ed 101 Introd. to Ind. Ed.	1	(1,0)	In Ed 102 Woodworking I	2	(1,3)
Math 101 Math. Analysis I	3	(3,0)	Math 102 Math. Analysis II	3	(3,0)
Science Elective[§]	4	(3,3)	Science Elective[§]	4	(3,3)
Social Science Elective[†]	3	(3,0)	Social Science Elective[†]	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			16	

SOPHOMORE YEAR

EG 201 Engr. Graph. for Ind. Ed.	3	(1,6)	EG 202 Graphic Tech. for Ind. Ed.	3	(1,6)
In Ed 202 Woodworking II	2	(1,3)	In Ed 204 Graphic Arts	3	(1,6)
In Ed 203 Basic Metal Process.	3	(1,6)	In Ed 205 Power Technology	3	(2,2)
Literature Requirement[*]	3	(3,0)	In Ed 313 Arts & Crafts	3	(2,3)
Science Elective[§]	4	(3,3)	Literature Requirement[*]	3	(3,0)
AS or MS or Elective	1		Social Science Elective[†]	3	(3,0)
	16		AS or MS or Elective	1	
				19	

JUNIOR YEAR

Ed 302 Ed. Psychology	3	(3,0)	Ed 335 Adol. Growth & Develop.	3	(3,0)
Engl 301 Public Speaking	3	(3,0)	In Ed 305 Machining Practices	3	(1,6)
In Ed 302 Dwell. Mat. & Constr.	2	(1,2)	In Ed 333 Design	3	(2,2)
In Ed 303 Electricity	3	(1,6)	In Ed 414 Electronics	3	(1,6)
Social Science Elective[†]	3	(3,0)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3	(3,0)
Text 460 Textile Processes	3	(3,0)	In Ed 441 Comp. Shop Practices.	2	(2,0)
Approved Elective[‡]	2	(2,0)			
	19			17	

SENIOR YEAR

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 458 Health Education	3	(3,0)
Ed 406 Hist. & Phil. of Ed.	3	(3,0)	In Ed 402 Directed Teaching	6	(0,18)
In Ed 405 Course Org. & Eval.	3	(3,0)	In Ed 425 Teaching Ind. Subj.	3	(3,0)
In Ed 416 Des. & Op. Ind. Ed. Lab.	3	(2,2)	Mus 210 Music Appreciation	3	(3,0)
Approved Elective[‡]	6	(6,0)		15	
	18				

135 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Social Science electives to be selected from history, sociology, economics, political science, religion, or philosophy. At least two fields must be represented with six, but not more than six hours, in one field.

[‡] See class adviser for list of approved electives.

[§] Science electives to be selected from chemistry, physics, geology, biology, botany, zoology, or physical science. At least two fields must be represented, one of which must be in the biological sciences.

VOCATIONAL-TECHNICAL EDUCATION OPTION

Freshman Year

First Semester		*Second Semester*	
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
In Ed 101 Introd. to Ind. Ed.	1 (1,0)	In Ed 102 Woodworking I	2 (1,3)
Math 101 Math. Analysis I	3 (3,0)	Math 102 Math. Analysis II	3 (3,0)
Science Elective§	4 (3,3)	Science Elective§	4 (3,3)
Social Science Elective†	3 (3,0)	Social Science Elective†	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	15		16

Sophomore Year

First Semester		*Second Semester*	
EG 201 Engr. Graph. for Ind. Ed.	3 (1,6)	EG 202 Graph Tech. for Ind. Ed.	3 (1,6)
In Ed 202 Woodworking II	2 (1,3)	In Ed 204 Graphic Arts	3 (1,6)
In Ed 203 Basic Metal Processes	3 (1,6)	In Ed 205 Power Technology	3 (2,2)
Literature Requirement*	3 (3,0)	Literature Requirement*	3 (3,0)
Science Elective§	4 (3,3)	Social Science Elective†	3 (3,0)
AS or MS or Elective	1	AS or MS or Elective	1
	16		16

SUMMER

In Ed 350 Industrial Cooperative Experience....... 6

Junior Year

First Semester		*Second Semester*	
Ed 302 Ed. Psychology	3 (3,0)	Ed 335 Adol. Growth & Develop.	3 (3,0)
Engl 301 Public Speaking	3 (3,0)	In Ed 305 Machining Practices	3 (1,6)
In Ed 302 Dwell. Mat. & Constr.	2 (1,2)	In Ed 333 Design	3 (2,2)
In Ed 303 Electricity	3 (1,6)	In Ed 422 Hist. & Phil. of Ind. & Voc. Ed.	3 (3,0)
Approved Elective (in field of specialization)‡	4 (4,0)	Social Science Elective†	3 (3,0)
	15		15

SUMMER

In Ed 450 Industrial Cooperative Experience....... 6

Senior Year

First Semester		*Second Semester*	
AAH 303 Evol. of Visual Arts	3 (3,0)	Ed 458 Health Education	3 (3,0)
Ed 406 Hist. & Phil. of Ed.	3 (3,0)	In Ed 402 Directed Teaching	6(0,18)
In Ed 405 Course Org. & Eval.	3 (3,0)	In Ed 425 Teaching Ind. Subj.	3 (3,0)
In Ed 416 Des. & Op. Ind. Ed. Lab.	3 (2,2)	Mus 210 Music Appreciation	3 (3,0)
Approved Elective (in field of specialization)‡	3 (3,0)		15
	15		

135 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Social Science electives to be selected from history, sociology, economics, political science, religion, or philosophy. At least two fields must be represented with six, but not more than six hours, in one field.

‡ See class adviser for list of approved electives.

§ Science electives to be selected from chemistry, physics, geology, physical science, biology, botany, or zoology. At least two fields must be represented, one of which must be in the biological sciences.

SCIENCE TEACHING

The program leading to a Bachelor of Science degree in Science Teaching is designed for students planning to teach Mathematics, Biology, Chemistry, Earth Science, or Physical Sciences on the secondary school level.

It requires a major concentration in Mathematics, Biological Sciences, Chemistry, Earth Science, or Physical Sciences. The required science electives are included to give some degree of competency in a field other than the major area.

A student must have a minimum of 130 semester hours of credit for graduation.

TEACHING AREA: BIOLOGICAL SCIENCES

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 112 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
Math 103 College Algebra	2	(3,0)	AS or MS or Elective	1	
Math 104 Trigonometry	2	(3,0)		15	
AS or MS or Elective	1				
	16				

SOPHOMORE YEAR

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Chemistry Elective	4		and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Literature Requirement*	3	(3,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
AS or MS or Elective	1		Chemistry Elective	4	
			Literature Requirement*	3	(3,0)
	15		Phys 208 Gen. Physics	4	(3,2)
			AS or MS or Elective	1	
				15	

JUNIOR YEAR

Bot 202 Surv. of Plant Kingdom	4	(3,3)	Bot 352 Plant Physiology	4	(3,3)
Ed 301 History of Amer. Ed.	3	(3,0)	or Zool 458 Cell Physiology	3	(2,3)
Zool 301 Comp. Vertebrate Anat.	3	(2,3)	Ed 302 Educational Psych.	3	(3,0)
Science Elective	3		Gen 302 Genetics	4	(3,3)
Social Science Elective§	3		Micro 305 Gen. Microbiology	4	(3,3)
Elective	3		Social Science Elective§	2	
	19			17 — 16	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching‡	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Major Elective†	6 — 7		Mus 210 Music Appreciation	3	(3,0)
Elective	3			15	
	18 — 19				

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Botany, genetics, microbiology, zoology.

‡ Block schedule must be taken as shown.

§ Economics, geography, philosophy, political science, religion, sociology.

TEACHING AREA: EARTH SCIENCE

Freshman Year

First Semester			Second Semester		
Ch 101 General Chemistry	4	(3,3)	Biol 101 Prin. of Biology	3	(3,0)
Ed 100 Orientation	1	(1,0)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Math 101 Math. Analysis I[§]	3	(3,0)	Math 102 Math. Analysis II	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	15			17	

Sophomore Year

Geol 201 Phys. Geology	4	(3,3)	Bot 102 Prin. of Botany	2	(2,0)
Literature Requirement[*]	3	(3,0)	Bot 104 Lab. Exercise in Botany	1	(0,2)
Phys 207 General Physics	4	(3,2)	Geol 202 Historical Geology	4	(3,3)
Zool 102 Prin. of Zoology	2	(2,0)	Literature Requirement[*]	3	(3,0)
Zool 104 Lab. Exercise in Zool.	1	(0,2)	Phys 208 General Physics	4	(3,2)
Social Science Elective[†]	3	(3,0)	Elective	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	18			18	

Junior Year

Astr 301 Gen. Astronomy	3	(3,0)	Ed 302 Educational Psychology	3	(3,0)
Ed 301 History of Amer. Ed.	3	(3,0)	Geol 405 Geomorphology	4	(3,3)
Geol 306 Mineralogy	3	(2,3)	Phys 240 Physics of Atmospheric Environment	3	(3,0)
Math 203 Elementary Statistical Inference	3	(3,0)	Science Elective	3	
Elective	3		Social Science Elective[†]	3	(3,0)
	15			16	

Senior Year

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching[‡]	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Science Elective	3		Mus 210 Music Appreciation	3	(3,0)
Elective	4			15	
	16				

130 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Economics, geography, philosophy, political science, religion, sociology.

[‡] Block schedule must be taken as shown.

[§] *Prerequisite:* Satisfactory score on the Mathematics Test, Level I, or Math 104.

TEACHING AREA: CHEMISTRY

Freshman Year

First Semester			Second Semester		
Ch 101 General Chemistry	4	(3,3)	Ch 112 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3.0)	Hist 172 or 173 West. Civilization	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	AS or MS or Elective	1	
AS or MS or Elective	1			15	
	16				

Sophomore Year

Biol 101 Prin. of Biology	3	(3.0)	Bot 102 Prin. of Botany	2	(2,0)
Literature Requirement[*]	3	(3,0)	and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Math 206 Cal. of Sev. Var.	4	(5,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
AS or MS or Elective	1		Literature Requirement[*]	3	(3,0)
	15		Phys 208 Gen. Physics	4	(3,2)
			Social Science Elective[‡]	3	
			Elective	3	
			AS or MS or Elective	1	
				17	

JUNIOR YEAR

First Semester			*Second Semester*		
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 331 Physical Chem.	3	(3,0)
Ch 313 Quantitative Analysis	3	(3,0)	Ch 339 Physical Chem. Lab.	1	(0,3)
Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Social Science Elective‡	3		Elective	7	
Elective	6				
	19			17	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ch 332 Physical Chem.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ch 340 Physical Chem. Lab.	1	(0,3)	Ed 458 Health Education	3	(3,0)
Ch 402 Inorganic Chemistry	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Ed 335 Adol. Growth & Develop.	3	(3,0)			
Ed 498 Sec. School Reading	3	(3,0)			
	16			15	

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Block schedule must be taken as shown.
‡ Economics, geography, philosophy, political science, earth science, religion, sociology.

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)	or Ch 112 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			15	

SOPHOMORE YEAR

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Literature Requirement*	3	(3,0)	and Bot 104 Lab. Exercises in Bot.	1	(0,2)
Math 206 Cal. of Sev. Var.	4	(5,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 207 Gen. Physics	4	(3,2)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
AS or MS or Elective	1		Literature Requirement*	3	(3,0)
	15		Math 295 Found. of Anal.	3	(3,0)
			Phys 208 Gen. Physics	4	(3,2)
			AS or MS Elective	1	
				14	

JUNIOR YEAR

Ed 301 History of Amer. Ed.	3	(3,0)	Ed 302 Educational Psych.	3	(3,0)
Math 301 Stat. Th. & Meth. I	3	(3,0)	Math 408 Topics in Geom.	3	(3,0)
Math 308 College Geometry	3	(3,0)	Math 411 Linear Algebra	3	(3,0)
Science Elective	3		Science Elective	3	
Social Science Elective§	3		Social Science Elective§	3	
Elective	4		Elective	3	
	19			18	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	Ed 412 Directed Teaching†	6	(1,15)
Ed 335 Adol. Growth & Develop.	3	(3,0)	Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)	Ed 458 Health Education	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
Math Elective‡	6	(6,0)			
	18			15	

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Block schedule must be taken as shown.
‡ Suggested electives: Math 405, 409, 452, 453, 454, Comp Sc 205, 210.
§ Economics, geography, philosophy, political science, religion, sociology.

TEACHING AREA: PHYSICAL SCIENCES

FRESHMAN YEAR

First Semester

Ch 101 General Chemistry	4	(3,3)
Ed 100 Orientation	1	(1,0)
Engl 101 English Composition	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)
Math 103 College Algebra	2	(3,0)
Math 104 Trigonometry	2	(3,0)
AS or MS or Elective	1	
	16	

Second Semester

Ch 112 General Chemistry	4	(3,3)
Engl 102 English Composition	3	(3,0)
Hist 172 or 173 West. Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)
AS or MS or Elective	1	
	15	

SOPHOMORE YEAR

Biol 101 Prin. of Biology	3	(3,0)
Literature Requirement*	3	(3,0)
Phys 207 General Physics	4	(3,2)
Science Elective	4	
Elective	3	
AS or MS or Elective	1	
	18	

Bot 102 Prin. of Botany	2	(2,0)
Bot 104 Lab. Exercises in Bot.	1	(0,2)
or Zool 102 Prin. of Zoology	2	(2,0)
and Zool 104 Lab. Exer. in Zool.	1	(0,2)
Ch 201 Elem. Org. Chemistry	4	(3,3)
Literature Requirement*	3	(3,0)
Phys 208 General Physics	4	(3,2)
AS or MS or Elective	1	
	15	

JUNIOR YEAR

Astr 301 General Astronomy	3	(3,0)
Ed 301 History of Amer. Ed.	3	(3,0)
Geol 201 Physical Geology	4	(3,3)
Social Science Elective‡	3	
Elective	4	
	17	

Astr 302 General Astronomy	3	(3,0)
Ed 302 Educational Psychology	3	(3,0)
Geol 202 Historical Geology	4	(3,3)
Phys 460 Mod. Physics for H. S. Teachers	3	(3,0)
Social Science Elective‡	3	
	16	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)
Ed 335 Adol. Growth & Develop.	3	(3,0)
Ed 498 Sec. School Reading	3	(3,0)
Elective	9	
	18	

Ed 412 Directed Teaching†	6	(1,15)
Ed 424 Meth. & Mat. in Sec. Sch.	3	(3,0)
Ed 458 Health Education	3	(3,0)
Mus 210 Music Appreciation	3	(3,0)
	15	

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Block schedule must be taken as shown in either semester of the senior year.

‡ Economics, geography, philosophy, political science, religion, sociology.

COLLEGE OF ENGINEERING

The College of Engineering offers professional curricular programs and programs in both Engineering Analysis and Technical Operations. Each of the programs offered leads to a wide range of career opportunities and serves as preparation for further study at the graduate level.

Professional Curriculums: Six four-year, professional-oriented curriculums are offered by the College of Engineering; namely, Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, and Mechanical Engineering. Each of these curriculums is accredited by the Engineers' Council for Professional Development, the recognized national accrediting agency for professional curriculums in engineering. The curriculum in Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.

Although the College of Engineering does not offer specific options or majors in each of these professional curriculums, the instruction includes many phases of each respective field. Thus, a Civil Engineering student is graduated in Civil Engineering rather than Structural Engineering, Highway Engineering, Sanitary Engineering, or other such options. However, a student who wishes to study within the areas encompassed by these options will find adequate courses within the Civil Engineering curriculum to prepare himself for work in any of these areas. In the same way the other engineering curriculums include thorough education in various phases of the field of specialization without over-emphasizing one phase to the neglect of others. The professional curriculums lead to a Bachelor of Science degree in the specific professional area.

The courses required in all professional curriculums for the freshman year are as follows:

FRESHMAN YEAR

First Semester *		*Second Semester*	
Ch 101 General Chemistry	4 (3,3)	Basic Science†	3 — 4
Engr 180 Engineering Concepts	3 (2,2)	Engl 102 English Composition	3 (3,0)
or Humanistic—Social Elective	3 (3,0)	Humanistic–Social Elective	3 (3,0)
Engl 101 English Composition	3 (3,0)	or Engr 180 Engr. Concepts	3 (2,2)
Math 106 Cal. of One Var.	4 (5,0)	Math 108 Cal. and Lin. Alg.	4 (5,0)
AS or MS or Elective	1	Phys 122 Mech. and Wave Phen.	3 (3,0)
		AS or MS or Elective	1
	15		17 — 18

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* Agricultural Engineering students take Agric 101, Introduction to Agriculture, in addition to other courses in the first semester.

† Agricultural Engineering and Ceramic Engineering students may take either Ch 102 or 112, General Chemistry. Chemical Engineering students are required to take Ch 112, General Chemistry.

Engineering Analysis Curriculum:† This curriculum is a four-year, engineering science-oriented course of study. Its objectives are two-fold. These are (1) to prepare a student for employment in areas of engineering activity requiring a high level of analytical competency, and (2) to provide a flexible undergraduate preparation for the study of engineering at the graduate level.

The curriculum leads to the Bachelor of Science degree in Engineering Analysis. Requirements for this degree are stated in terms of subject matter area rather than in terms of specific courses. This latitude of course selection permits maximum accommodation of the individual student's interests and career objectives. Degree requirements are as follows:

	Semester Credit Hours
Mathematics (including 12 credits of post-calculus mathematics)	24
Basic Science (including 8 semester hours of physics)	16
Engineering Science (distributed in at least six engineering science areas)	32
Area of Concentration	12
Humanistic-Social Studies	32
Electives	22
	138

The educational objectives of the program will be met by the selection of an area of concentration which will be chosen from several specialty areas offered within the other professional engineering curriculums. The selection of specific courses, particularly in the junior and senior years, will then depend primarily on the choice of the area of concentration.

Maximum flexibility within this program is achieved by permitting a student to defer his choice of specialization until the junior year or later. Such deferral will then allow students from junior and senior colleges not offering engineering to transfer into the program with little or no loss in academic credit.

Technical Operations Curriculum:† This curriculum is a four-year, student-interest oriented course of study which leads to a Bachelor of Science degree in Technical Operations. It provides a broad base of fundamentals and their application in the areas of electricity, heat, and mechanics. In addition, approved electives amounting to approximately two semesters of work permit developing a program to match the student's aptitudes and interests as related to industrial and other employment opportunities. These opportunities are found in such areas as production supervision and management, planning industrial production methods, technical sales, technical purchasing, building construction, quality control, technical personnel management and supervision of plant environmental and energy systems.

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† Additional information on both the Engineering Analysis and the Technical Operations programs is available from the Office of the Dean of Engineering.

The difference between the Bachelor of Science degree in the engineering curriculums and the Bachelor of Science degree in the Technical Operations program rests, in general, on the former being concerned with original system design and the latter with operation and adaptation of that design to meet the needs of mankind. The Technical Operations curriculum is designed to meet a broad base of general practitioner-type needs in industry and other types of enterprise in contrast to those requiring an in-depth specialist.

The curriculum leads to the Bachelor of Science degree in Technical Operations. Requirements for the degree are as follows:

	Semester Credit Hours
Mathematics	12
Basic Science (including 8 semester hours of physics)	16
Humanistic-Social Studies	24
Technical Operations	42
Electives	30
As or MS or Elective	4
	128

The technical operations courses are only offered during the junior and senior years of the program. Hence, a student from a junior college may transfer into the program at the junior level with little or no loss of academic credit.

AGRICULTURAL ENGINEERING*

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The Agricultural Engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

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* The Agricultural Engineering curriculum is jointly administered by the College of Agricultural Sciences and the College of Engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to the Master of Science, the Master of Engineering, and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, and extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

AGRICULTURAL ENGINEERING CURRICULUM

(See page 164 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
AgE 221 Soil and Water Res. Engr. I	3	(2,3)	AgE 212 Fund. of Mechanization	3	(2,3)
EG 109 Engr. Graph. Com.	2	(0,6)	Biol 101 Prin. of Biology	3	(3,0)
EM 201 Engr. Mech. (Statics)	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Ther. and Elec. Phen.	3	(3,0)	AS or MS or Elective	1	
AS or MS or Elective	1				
	19			17	

Junior Year

AgE 353 Computational Systems	2	(1,3)	AgE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AgE 355 Engr. Anal. and Creat.	2	(1,3)	AgE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
Bot 102 Prin. of Botany	2	(2,0)	Agron 202 Soils	3	(2,2)
E&CE 307 Basic Elec. Engr.	3	(3,0)	E&CE 320 Electronics I	2	(2,0)
EM 304 Mechanics of Materials	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
ME 311 Engr. Thermo. I	3	(3,0)	Humanistic—Social Elective	3	(3,0)
Zool 102 Prin. of Zoology	2	(2,0)			
	17			17	

Senior Year

AgE 431 Agric. Struct. Design	3	(2,3)	AgE 416 Agric. Machinery Design	3	(2,3)
AgE 471 Undergraduate Research	1	(0,3)	AgE 422 Soil & Water Res. Engr. II	3	(2,3)
Econ 201 Principles of Econ.	3	(3,0)	AgE 442 Agric. Proc. Engr.	3	(2,3)
EM 320 Fluid Mechanics	3	(3,0)	Bot 352 Plant Physiology	4	(3,3)
Math 301 Stat. Theory and Meth. I	3	(3,0)	or Zool 307 Animal Anatomy and Physiol.	3	(2,3)
Free Elective	4 — 3		or Micro 305 Gen. Microbiology	4	(3,3)
	17 — 16		ME 304 Heat Transfer I	3	(3,0)
			Free Elective	3	
				19 — 18	

138 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

CERAMIC ENGINEERING

Ceramic Engineering offers rewarding careers for persons interested in making useful products. The ceramic products range from items important to everyday life, such as brick, cement, and glass to more exotic products, such as ceramic fuel elements for nuclear reactors, ceramic parts for electronic equipment and ceramic nose cones, ceramic heart valves, and other prosthetic parts for medical research. A variety of occupations are available to the ceramic engineering graduate thus making it possible to select a type of work that is compatible with individual preferences. Some graduates work as researchers, developing new ceramic knowledge; others are design engineers, creating new processes or new products; still others are engaged in technical sales, supervision of plant operations or in management.

South Carolina possesses a wide variety of ceramic minerals which rank with forests as the richest natural resources in the State and make it possible for South Carolina to contribute raw materials to every major classification of the ceramic industry. South Carolina has a diversified ceramic industry with plants manufacturing portland cement, glass containers, glass fibers, sewer pipes, brick, refractories, special raw materials, and electronic ceramics.

The curriculum of Ceramic Engineering leads to the degree of Bachelor of Science in Ceramic Engineering, and graduate courses are offered leading to advanced degrees. The course is based on a study of the fundamental courses in chemistry, physics, mathematics, and geology, and advanced courses are designed to apply these fundamental sciences to Ceramic Engineering. Courses in the humanities and social sciences together with courses in engineering sciences form major parts of the curriculum. A large number of elective courses permits the individual student to plan a program that is compatible with his particular interests, talents, and educational goals.

The Ceramic Engineering building and equipment are recognized as outstanding throughout the nation. These facilities were provided by a grant from the Olin Foundation.

CERAMIC ENGINEERING CURRICULUM

(See page 164 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
CrE 201 Introd. to Cer. Engr.	2	(2,0)	CrE 202 Ceramic Materials	3	(3,0)
CrE 204 Lab. Procedures	1	(0,3)	E&CE 298 Dig. Comp.	1	(1,0)
Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Planned Elective	3		Planned Elective	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			18	

Junior Year

Ch 331 Physical Chem.	3	(3,0)	Ch 332 Physical Chem.	3	(3,0)
CrE 304 Exp. Design	1	(0,3)	CrE 302 Thermo-Chem. Cer.	3	(3,0)
CrE 307 Thermal Process.	3	(3,0)	CrE 309 Research Meth.	2	(0,6)
EM 201 Engr. Mech. (Statics)	3	(3,0)	E&CE 330 Systems I	3	(3,0)
Math 301 Stat. Theory & Meth. I	3	(3,0)	E&CE 331 Electric Circuits Workshop I	3	(2,2)
Planned Elective	4		Free Elective	3	
	17			17	

Senior Year

CrE 402 Solid St. Cer.	3	(3,0)	CrE 403 Glasses	3	(3,0)
E&CE 320 Electronics I	2	(2,0)	ME 304 Heat Transfer I	3	(3,0)
EM 304 Mech. of Mat.	3	(3,0)	Planned Electives	12	
Planned Electives	7				
Free Elective	3				
	18			18	

138 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

Note: 9 credits of Planned Electives must be taken in humanistic-social science courses. 19 credits of Planned Electives should be technical courses selected with the help of class adviser.

CHEMICAL ENGINEERING

The graduate of the science-oriented, research-minded Chemical Engineering Department is finding intellectually stimulating and financially rewarding positions in all phases of modern endeavor. The traditional chemical process industries which produce the industrial chemicals upon which our modern society is based require large numbers of chemical engineers. In addition, because of the fundamental nature of the Chemical Engineering curriculum, the graduate is avidly sought by industries in many areas of specialized technology such as nuclear power, aviation and space, fibers and textiles, pharmaceuticals, pulp and paper, computers, foods, metals, ceramics, instrumentation and automatic control, and petroleum. The chemical engineer is in the forefront of the fight against environmental pollution, and is leading the way in applying engineering technology to the solution of medical and health-related problems.

The Chemical Engineering curriculum is unique in that it is built upon a firm base in three sciences (chemistry, physics, and mathematics), hence the chemical engineer is able to apply scientific knowledge to the solution of problems involving both chemical and physical principles. In chemical engineering courses emphasis is placed upon why things happen as they do and not how; upon enduring principles and not present or past methods. The student is taught to realize that all material things are chemical in nature; hence the chemical engineer, in the practice of his profession, may be called upon to work with anything on the face of the earth. He will be concerned with the conception, design, construction, and management of complete systems of men, processes, computers, and procedures for the most efficient production of chemicals and related products. He produced all the materials required to land men on the moon, he produced uranium to power nuclear reactors, he produced instant foods, he created the synthetic fiber industry, etc. The scope of chemical engineering is broad and the profession is interdisciplinary in nature.

In spite of the strong scientific flavor of the Chemical Engineering curriculum the faculty is constantly striving to impress upon the student that he is studying engineering and not pure science. The ultimate purpose of engineering is to serve mankind by making practical use of scientific and engineering theories and laboratory schemes, thus the engineer must always design his processes to produce products at minimum cost. The chemical engineer in industry must, in brief, be concerned that his company be profitable since it could not exist otherwise.

In industry the chemical engineer may pursue one of two parallel lines of advancement. One path leads to management, and it should be noted that the top managers of most chemical companies are technically educated men. The second and equally rewarding path is in engineering research and development. In this latter category are found the men who have developed the processes and products which shape the modern world in which we live.

The majority of chemical engineers terminate their formal education at the B.S. level, but the Chemical Engineering curriculum also provides an excellent foundation for further education at the graduate level. The most common advanced study path chosen by chemical engineering graduates is continuation in Chemical Engineering to the Master of Science or Doctor of Philosophy degree which provides the added depth of knowledge often required in engineering research and development, as well as the opportunity for specialization. Moreover, the Chemical Engineering graduate, with his excellent background in chemistry, physics, and mathematics as well as in engineering, is well prepared for graduate study in such fields as nuclear engineering, biomedical engineering, environmental engineering, and business and patent law. In addition, by choosing the proper biology courses as electives, the student can receive excellent preparation for entrance into medical or dental schools. Upon receiving their M.D. degree, individuals having chosen chemical engineering as a pre-medical course will be exceptionally well prepared to deal with present and future technological advances in medical practice as well as for work in many research areas.

The Chemical Engineering Department at Clemson is housed in Earle Hall, one of the newest and best equipped buildings for chemical engineering education in the nation. All members of the Chemical Engineering faculty have been educated at the doctoral level and the department offers work leading to the Master of Science and Doctor of Philosophy degrees as well as the Bachelor of Science degree.

CHEMICAL ENGINEERING CURRICULUM

(See page 164 for *Freshman Year*)

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Organic Chem.	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
ChE 201 Introd. to Chem. Engr.	3	(2,3)	Ch 229 Organic Chem. Lab.	1	(0,3)
EM 201 Engr. Mech. (Statics)	3	(3,0)	ChE 202 Stagewise Separation Op.	4	(3,3)
Literature Requirement*	3	(3,0)	Comp Sc 210 Algorith. Process. for Engrs.†	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Literature Requirement*	3	(3,0)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
AS or MS or Free Elective	1		AS or MS or Free Elective	1	
	20			19	

JUNIOR YEAR

Ch 331 Physical Chem.	3	(3,0)	Ch 332 Physical Chemistry	3	(3,0)
Ch 339 Physical Chem. Lab.	1	(0,3)	Ch 340 Phys. Chem. Lab.	1	(0,3)
ChE 301 Unit Op. Theory I	3	(3,0)	ChE 302 Unit Op. Theory II	3	(3,0)
E&CE 307 Basic Elec. Engr.	3	(3,0)	ChE 306 Unit Op. Lab. I	1	(0,3)
Phys 222 Opt. & Mod. Phys.	3	(3,0)	ChE 331 Chem. Engr. Thermo. I.	3	(3,0)
Humanistic–Social Elective	3	(3,0)	ChE 352 Chem. Engr. Sys. Anaysis	4	(3,3)
Free Elective	3		EM 304 Mech. of Materials	3	(3,0)
	19			18	

SENIOR YEAR

ChE 401 Trans. Phen.	3	(3,0)	ChE 422 Dev., Des., & Opt. II	3	(0,9)
ChE 407 Unit Op. Lab. II	2	(0,6)	ChE 453 Process Dynamics	3	(3,0)
ChE 421 Dev., Des. & Op. I	3	(2,3)	CrE 419 Sci. of Engr. Materials	3	(3,0)
ChE 430 Chem. Engr. Thermo. II	3	(3,0)	Humanistic–Social Elective	6	(6,0)
ChE 440 Inspection Trip	0		Free Elective	3	(3,0)
ChE 450 Chem. Engr. Kinetics	3	(3,0)		18	
Humanistic–Social Electives	3	(3,0)			
	17				

144 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Or ChE 210 if offered.
Note: Six credit hours of Advanced MS or AS may be taken as the Free Electives.
Elective Policy. All electives must be chosen from a departmental elective list. A copy of this list may be obtained from the departmental secretary.

CIVIL ENGINEERING

Civil Engineering is the broadest in scope of the engineering professions, being the parent stem from which most of the other branches of engineering have developed. All branches of Civil Engineering rest on a comparatively compact body of principles, in which the students are thoroughly trained in the classroom, the drafting room, the laboratory, and the field. Particular effort is made to develop those qualities essential to success in any field of endeavor and to fit the graduate to become a useful citizen—a good businessman as well as a successful engineer.

The practice of civil engineering involves the planning, design, construction, maintenance, and use of large structures and systems to control and improve the environment for modern civilization. The structures may serve many purposes, such as buildings for commerce and industry, bridges for transportation, vehicles for space exploration, or dams for the control and storage of water or for generation of power. The systems provide essential services: water supply; waste water treatment; rail, air, and water transportation; and systems of highways. Projects such as these require that the civil engineer be trained in the social and economic issues as well as in basic science, engineering science, and technology. Though he may specialize in a particular branch of civil engineering, such as structural or transportation, he will need some acquaintance with all subdivisions of civil engineering as well as of other branches of engineering.

The course in Civil Engineering at Clemson University leads to the degree of Bachelor of Science and is planned to equip the graduate with a working knowledge of the above subjects. The student receives training in the basic sciences of mathematics, chemistry, and physics, and is introduced gradually to the engineering sciences and the technical courses in civil engineering. By the end of the junior year the student will have had courses in structural design, construction materials, transportation engineering, and soil mechanics. These will enable him to choose technical electives in his senior year in the subdivision of his choice. The nontechnical electives are sufficient in number to provide breadth in the arts and humanities, and assure that the graduate has a well-rounded education.

The civil engineering graduate is prepared to work immediately upon graduation in practically any of the areas of the profession. He may find himself in responsible charge at an early date, so every effort is made to train him at Clemson in the ethical standards demanded by the profession. All courses are directed toward the development of initiative, self-reliance, and integrity in the student.

The department is located in Lowry Hall, a modern air-conditioned structure erected in 1958. The laboratories are well equipped, and the classrooms are light and conducive to study. The building has an internal television system and the 220-seat auditorium is one of the most attractive ones on the campus.

CIVIL ENGINEERING CURRICULUM

(See page 164 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
CE 206 Geometrics	2	(1,3)	CE 205 Civil Engr. Meth.	2	(1,3)
EM 201 Engr. Mech. (Statics)	3	(3,0)	or EG 109 Engr. Graph. Com.	2	(0,6)
Literature Requirement*	3	(3,0)	EM 304 Mech. of Materials	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	EM 305 Mech. of Materials Lab.	1	(0,3)
Phys 221 Ther. & Elec. Phen.	3	(3,0)	Literature Requirement*	3	(3,0)
AS or MS or Elective	1		Math 208 Engr. Math. I	4	(5,0)
			Phys 222 Opt. and Mod. Phys.	3	(3,0)
	16		Phys 224 Modern Phys. Lab.	1	(0,3)
			AS or MS or Elective	1	
				18	

Junior Year

CE 301 Introd. to Struc. Sci.	3	(2,2)	CE 302 Struc. Design I	3	(2,2)
CE 320 Conc. & Bit. Materials	2	(1,3)	CE 310 Trans. Engr.	4	(3,2)
CrE 310 Introd. to Mat. Sci.	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
EM 202 Engr. Mech. (Dynamics)	3	(3,0)	E&CE Elective	3	(3,0)
ESE 401 Environ. Engr.	3	(3,0)	Humanistic–Social Elective†	3	
Math Elective†	3		Free Elective†	3	
	17			19	

Senior Year

CE 330 Soil Mechanics	3	(2,2)	CE 402 Struc. Design II	3	(2,2)
CE 424 Constru. Meth.	2	(2,0)	CE 425 Engr. Relations	3	(3,0)
EM 320 Fluid Mech.	3	(3,0)	EM 421 Hydrol. & Hyd.	2	(2,0)
EM 322 Fluid Mech. Lab.	1	(0,3)	ME 311 Engr. Thermo. I	3	(3,0)
Earth or Life Sci. Elective†	3		Free Elective†	3	
Humanistic–Social Elective†	3		Technical Elective†	3	
Technical Elective†	3			17	
	18		138 Total Semester Hours		

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Each class adviser has a list of approved electives from which students may make selections. Any exceptions to this list must have the approval of the department head.

ELECTRICAL AND COMPUTER ENGINEERING

Electrical and computer engineering is the largest and most diversified of the engineering disciplines. Its technical society membership is more than double that of any other and the responsibilities of the profession range from highly analytical problem solving to detailed design of electronics, communications and computing systems. Electrical and computer engineers have traditionally occupied key positions in a wide variety of engineering programs and their educational program must be structured to allow for this diversity of career objectives. The Electrical and Computer Engineering Department allows this flexibility of course selection in its curriculum. A liberal number of humanistic-social electives provide the graduate with the ability to address himself to both the "how" and the "why" of engineering.

The flexibility of the curriculum allows either a sampling from the many aspects of Electrical and Computer Engineering or a concentration in a specific area. The student's interests and career objectives are carefully considered by the Electrical and Computer Engineering advising staff in structuring a program of study.

Electrical and Computer Engineering can be subdivided into the rather broad areas of networks and systems analysis, communications, electronics, computer science, and power. A brief discussion of each of these follows.

Systems and electric network analysis provides the fundamental core materials in the curriculum. These 18 credits of required work constitute the fundamental studies in analysis and experimentation which receive subsequent further development in elective courses. Computer simulation, mathematical modeling, experimental design and scientific reasoning are representative of the topics covered.

Computers, both analog and digital, are studied extensively in the Electrical and Computer Engineering program. Few areas in engineering present the promise of continued growth that is offered by the computing industry. In preparing the student to meet this challenge, the department offers courses in real-time computing, computer language structures, the theory and design of digital computers, computation and simulation of physical systems, information processing and data handling. The department operates its own digital and analog computing laboratories and has remote terminal equipment to the University Computer Center.

The study of electronics continues to be one of the most active professional areas in Electrical and Computer Engineering. Changes in this field have occurred so rapidly that equipment designed five years ago is obsolete by present design criteria. The vacuum tube gave way to the transistor sixteen years ago and just recently the integrated circuit has replaced the discrete solid-state device. The Electrical and Computer Engineering curriculum includes basic work in the theory of operation of solid-state devices, the design of solid-state circuits and the study of integrated circuit technology. Electronic laboratories within the department contain the most modern equipment available for the study of these devices, including special microscopic and micro-manipulation equipment needed in the study of minute integrated circuits.

The study of power systems analysis and energy conversion is carried out in a recently renovated power laboratory. This new facility contains the machinery and instrumentation necessary to explore solid-state-static motor control, dynamic speed and torque measurement techniques and power system stability.

Communication theory may be the most comprehensive field of specialization found in Electrical and Computer Engineering. It includes course work in information theory, electromagnetic theory, switching circuits and electronics. Engineers working in communication find themselves studying switching equipment in telecommunications, working on the plasma blackout problem in missile reentry, studying the design implications of complex missile detection and defense systems or they may be designing antennas and transmitting equipment for space satellites. Some will be trying to comprehend the nature of bioelectricity by studying the human brain.

The Honors Program in the Department of Electrical and Computer Engineering has for the past five years accounted for a large percentage of the honors students in the University. All qualified Electrical and Computer Engineering students are strongly urged to take advantage of this program since it will provide them with an opportunity to participate in some uncommonly rewarding educational experiences during their final two years of study. Honors students receive individualized professional guidance and special laboratory privileges in many of their courses. Honors students in the past have designed electronic devices, have written complex computer programs and have studied technical material which ordinarily would be reserved for students at the graduate level. Students are asked to contact their Electrical and Computer Engineering adviser for more information.

ELECTRICAL AND COMPUTER ENGINEERING CURRICULUM

(See page 164 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal and Elec. Phen.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
Technical Elective[†]	2		Phys 224 Modern Phys. Lab.	1	(0,3)
Humanistic–Social Elective[‡]	3		Humanistic–Social Elective[‡]	3	
AS or MS or Elective	1		Technical[†]/Humanistic–Social Elective[‡]	3	
			AS or MS or Elective	1	
	16			18	

Junior Year

E&CE 320 Electronics I	2	(2,0)	E&CE 321 Electronics II	2	(2,0)
E&CE 325 Electronics and Electromagnetics Lab. I	1	(0,2)	E&CE 326 Electronics and Electromagnetics Lab. II	1	(0,2)
E&CE 329 Logic and Comput. Devices	3	(2,2)	E&CE 332 Systems II	2	(2,0)
E&CE 330 Systems I	3	(3,0)	E&CE 333 Electric Circuits Workshop II	3	(2,2)
E&CE 331 Electric Circuits Workshop I	3	(2,2)	E&CE 341 Electric and Magnetic Fields II	2	(2,0)
E&CE 340 Electric and Magnetic Fields I	2	(2,0)	Humanistic–Social Elective[‡]	3	
Technical Elective[†]	3		Technical Elective[†]	3	
			Free Elective	3	
	17			19	

SENIOR YEAR

First Semester			*Second Semester*		
E&CE 410 Systems III	3	(3,0)	E&CE 450 Systems IV	3	(3,0)
E&CE 411 Elec. Sys. Workshop	2	(0,4)	E&CE 451 Systems Design Workshop	2	(0,4)
E&CE 422 Electronics III	2	(2,0)	Humanistic–Social Elective[‡]	3	
Technical Electives[†]	9		Technical Elective[†]	9	
Free Elective	3				
	19			17	

138 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] A minimum of 6 credits with Electrical and Computer Engineering designations are required among the technical electives. A distribution among the engineering sciences of not less than 9 credits is also required.

[‡] A list of approved humanistic–social electives is available from the student's adviser. Any exceptions to this list must be approved in writing by the department head.

MECHANICAL ENGINEERING

Mechanical engineers are involved in the solution to mankind's basic problems: the maintenance and development of food, shelter, clothing, health, transportation, and communications. These problems require that the mechanical engineer be prepared to work in a wide variety of areas including bioengineering, advanced power systems, environmental and life support systems, propulsion and transportation systems, food technology, textile processing and manufacturing, materials machining and processing, housing and construction techniques, ocean systems, and plant operation, production, and maintenance. His functions may range from technical management to basic research and development, but they all involve innovative problem-solving skills. The training received in such a program must be sufficiently general to serve these diverse areas, yet sufficiently thorough to assure technical competence for prolonged periods.

In preparing an individual to function in both nontechnical and technical areas for a professional career which will generally span 40-45 years, it is essential that the entire man be developed. In accomplishing this development a rather broad educational pattern is followed. It begins with a thorough preparation in the basic sciences: mathematics, chemistry, and physics. Parallel to this development the student gains proficiency in the necessary communications skills, reading and writing, and is taught to see himself as a nontechnical being in society through a study of history, political science, economics, etc. Next in the process comes a rigorous study of the engineering sciences: electrical, thermal, and mechanical sciences which are built upon mathematics, chemistry, and physics.

Upon completion of these fundamentals the program then begins to develop the applications and synthesis areas which distinguish the engineer from the scientist. The applications occur in the areas of energy conversion and transfer, mechanical design, and systems analysis.

The energy conversion and transfer area deals primarily with applications of the thermal sciences; thermodynamics, heat transfer, and fluid mechanics to various processes. For instance, one might consider the conversion of the chemical energy of fuels of other forms of energy to power ground transportation, high-speed commercial or military aircraft, or space vehicles. One might also consider means of converting this energy to a means of powering various refrigeration, air-conditioning and environmental control systems or evaluate systems for the direct use of solar energy to provide power, fresh water, and food for the underdeveloped countries of the world.

In the mechanical design area the student applies his recently acquired knowledge of strength of materials; mechanisms for converting motion; stress, strain, and deflection theories; automatic control theory; and lubrication and wear concepts to mechanical systems ranging from prosthetic devices for the handicapped to completely automated machines for manufacturing plants. Included in the range of applications which the student may pursue is the analysis of artificial knee, hip, and shoulder joints; an evaluation of new construction techniques for low-cost housing development; or study of remote manipulating schemes for work on the ocean floor. The applications in this area are numerous and bear on all man's basic problems.

The systems analysis area involves the use of mathematics, computer sciences (both analog and digital types), instrumentation, and a basic understanding of both mechanical and energy-conversion areas in the analytical and mathematical analysis of complex, real-world, physical systems. These systems may be made up of various electrical, mechanical, thermal, and hydraulic components. In this activity the student begins to apply *all* the fundamentals and applications previously acquired to the solution to *real* problems.

As an integral part of the entire program, and particularly near the conclusion of his study, the student is immersed in the relevant problem-solving aspects of engineering. He is shown that life does not present problems in a well-defined fashion and is taught the methodology of attacking problems not presented in "textbook" format. The "nontechnical" aspects of human factors, costs, environmental impact, and esthetics are considered in real problems taken from industry, the medical profession, or faculty interests. As the student attacks these problems he develops, under close faculty guidance, a methodology of thinking, planning, and implementing that will serve him in his career regardless of the particular field he chooses to enter. The student then possesses the fundamentals and the problem-solving methodology which will serve him for a career which may see aerospace wax and wane; the environment be a cause of alarm and then become well managed; foodstuffs change drastically in content and appearance; man rebuild his own body; and housing and communications be totally different from anything projected today. He is technically well prepared to manage, plan or perform any of the technical duties involved.

However, the mechanical engineer is not a totally technical being. His problem-solving skills are of great worth to his community and to society, and it is a goal of our educational process to broaden these skills and to instill in each graduate a sense of responsibility to society. The technical "loner" cannot be tolerated in the high technology society of tomorrow, no more so than today. Therefore, a significant portion of the Mechanical Engineering curriculum is devoted to study in the humanistic-social areas. The student may elect, with departmental approval, courses in political science, economics, philosophy, sociology, history, etc., in order to acquire a better understanding of his "nontechnical" world. Thus, those students who pursue a degree in Mechanical Engineering are trained in engineering fundamentals, their applications, and the "nontechnical" areas to assume a position of leadership in industry and society. In fact, these same thought processes and problem-solving skills developed in the mechanical engineering program serve as good preparation for a number of professions including politics, sales, human relations or general business areas, and many highly successful "nontechnical" individuals in society today are graduates of mechanical engineering programs.

Beyond the Bachelor of Science level discussed above, the Department of Mechanical Engineering offers study leading to the Master of Engineering, the Master of Science, and the Doctor of Philosophy degrees.

MECHANICAL ENGINEERING CURRICULUM

(See page 164 for *Freshman Year*)

Sophomore Year

First Semester			*Second Semester*		
EM 201 Engr. Mech. (Statics)	3	(3,0)	EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
ME 201 Innovative Design I	2	(1,3)	ME 202 Innovative Design II	2	(1,3)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	Phys 222 Opt. and Mod. Phys.	3	(3,0)
AS or MS or Elective[†]	1		Phys 224 Mod. Phys. Lab.	1	(0,3)
			AS or MS or Elective[†]	1	
	16			17	

JUNIOR YEAR

First Semester			*Second Semester*		
E&CE 331 Elec. Cir. Workshop I	3	(2,2)	E&CE 308 Electronics and Electromechanics	3	(2,2)
EM 304 Mech. of Materials	3	(3,0)	ME 304 Heat Transfer I	3	(3,0)
EM 320 Fluid Mech.	3	(3,0)	ME 312 Engr. Thermo. II	3	(3,0)
ME 311 Engr. Thermo. I	3	(3,0)	ME 314 Engr. Exp.	2	(1,2)
ME 313 Inst. & Meas.	2	(1,2)	ME 316 Dynamic Sys. Anal.	4	(3,3)
Humanistic–Social Elective†	3		ME 321 Fluid Dynamics	3	(3,0)
	17			18	

SENIOR YEAR

CrE 310 Material Sci.	3	(3,0)	ME 402 Innovative Design III	2	(1,2)
ME 401 Prin. of Mech. Engr. Des.	3	(3,0)	ME 414 Mech. Engr. Lab.	1	(0,2)
ME 404 Automatic Control	3	(3,0)	Technical Electives†	6	
ME 413 Mech. Engr. Lab.	1	(0,2)	Free Elective†	6	
Technical Electives†	6		Humanistic–Social Elective†	3	
Humanistic–Social Elective†	3				
	19			18	

138 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] All electives must be approved in advance by departmental adviser.

COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources is concerned with the management, use, and stewardship of all of our forest resources and with man's well-being through wise use of his leisure. These two general areas of study offer broad opportunities in the management of our forest and recreation resources for their maximum service to the present and future generations of man.

The College of Forest and Recreation Resources offers curriculums designed to prepare students for professional careers in the following areas.

The Forestry curriculum includes the fundamental and applied sciences needed in the management of the forest environment for its products and services. Forestry prepares graduates for employment as managers and administrators of forest lands for production of timber, water, wildlife, esthetic values, and recreational use.

The Recreation and Park Administration curriculum prepares recreation directors for counties, towns and cities, institutions, industries and youth-serving agencies. A park management emphasis may be pursued leading to a career with federal, state, county, and municipal park systems.

FORESTRY

The Forestry curriculum combines a broad education in liberal arts and the physical, mathematical, and biological sciences with the applied forestry sciences needed in the management of the forest and forest environment for their products and services. Foresters of professional standing are employed in various capacities by private concerns and by federal, state, and other public agencies.

Because of the nature of their education, foresters are qualified for a broad spectrum of employment possibilities. They may be engaged as managers, administrators, or owners of forest lands or forest-based businesses; as technical specialists in the production of timber, useable water, wildlife, and esthetic values, and in the recreational use of the forest; or as professionals in other areas where the conservation of our natural resources is a matter of concern. Foresters earning advanced degrees find employment in academic work and in research conducted both by public and private agencies.

The undergraduate curriculum provides a strong program in the basic knowledge and skills required of a professional forester. The curriculum is also designed to provide the necessary prerequisites for those students that desire to continue in graduate study. The Department of Forestry offers graduate programs that lead to a Master of Science or a Master of Forestry degree.

The Forestry curriculum is accredited by the Society of American Foresters.

FORESTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Prin. of Biology†	3	(3,0)	Bot 102 Prin. of Botany†	2	(2,0)
Ch 101 General Chemistry†	4	(3,3)	Bot 104 Lab. Exer. in Botany†	1	(0,2)
EG 105 Engineering Graphics†	2	(0,6)	Ch 102 General Chemistry†	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
For 101 Introd. to Forestry	1	(1,0)	For 102 Introd. to Forestry	1	(1,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Algebra	4	(5,0)
AS or MS or Elective	1		Zool 102 Prin. of Zoology	2	(2,0)
			AS or MS or Elective	1	
	18			18	

SOPHOMORE YEAR

Agron 202 Soils†	3	(2,2)	CE 201 Surveying†	3	(2,3)
Econ 201 Prin. of Economics	3	(3,0)	Comp Sc 205 Elem. Computer Programming	3	(3,0)
For 205 Dendrology†	4	(3,3)	Engl 301 Public Speaking	3	(3,0)
Literature Requirement*	3	(3,0)	For 206 Silvics†	4	(3,3)
Phys 207 Gen. Physics	4	(3,2)	Geol 219 Geol. for Foresters	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			17	

FORESTRY SUMMER CAMP §

For 251	Forest Plants	2
For 252	Forest Engineering	2
For 253	Forest Mensuration	4
For 254	Forest Products	1
		9

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Courses generally prerequisite to summer camp.

§ Students planning to eat in the University Dining Halls are advised to purchase individual meals rather than board plans during summer camp, because several days of travel away from campus can be anticipated during which students will be responsible for their own meals and lodging.

Note: The emphasis areas in Forestry are forest management, forest economics and marketing, forest biology, forest game management, forest recreation, forest harvesting, forest influences, forest protection, forest biometrics, forest soils, and the humanities. The student selects one of these and in consultation with his adviser schedules approved courses for that particular emphasis area. (See emphasis area credits on page 182.)

Junior Year

First Semester			*Second Semester*		
Ent 307 Forest Entomology	3	(2,3)	Bot 352 Plant Physiology	4	(3,3)
Ex St 301 Introd. Statistics	3	(2,2)	For 302 Forest Mensuration‡	3	(2,3)
For 308 Aerial Photos in For.‡	3	(2,3)	For 304 Forest Economics	3	(3,0)
WB 412 Wildlife Management	3	(2,3)	For 306 Wood & Wd. Fib. Ident.	2	(1,3)
Emphasis Area	3		For 310 Silviculture‡	4	(3,3)
Social Science Elective	3				
	18			16	

Senior Year

For 417 Forest Management and Regulation	4	(3,3)	For 401 Logging and Milling	3	(2,3)
For 420 Forest Products	2	(2,0)	For 412 Forest Protection	2	(2,0)
Pl Pa 405 Forest Pathology	3	(2,3)	For 414 Management Plans	1	(0,3)
Pol Sc 301 Am. Gov. & Pol. Par.	3	(3,0)	For 416 Forest Pol. and Admin.	2	(2,0)
Emphasis Area	6		For 418 Forest Valuation	3	(3,0)
			Approved Electives	6	
	18			17	

149 Total Semester Hours

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‡ Summer Camp prerequisite to these courses.

RECREATION AND PARK ADMINISTRATION

The curriculum in Recreation and Park Administration provides training for students who desire to become recreation supervisors and directors and park administrators. Graduates plan and supervise recreation programs in industry, institutions, municipalities and rural communities. The program which leads to a Bachelor of Science degree is designed to provide competencies in recreation administration, management, development, planning, and research. It requires 135 semester hours, including field training during one summer, for completion.

The department offers graduate study leading to a Master of Recreation and Park Administration degree.

RECREATION AND PARK ADMINISTRATION CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Engl 101 English Composition	3	(3,0)	and Bot 104 Lab. Exer. in Bot.	1	(0,2)
Hist 102 American History	3	(3,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Math 101 Mathematical Analysis I	3	(3,0)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
RPA 101 Introd. to Comm. Rec.	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
AS or MS or Elective	1		Engl 102 English Composition	3	(3,0)
	16		RPA 102 Hist. & Prin. O'door Rec.	3	(3,0)
			Soc 201 Introd. Sociology	3	(3,0)
			AS or MS or Elective	1	
				16	

Sophomore Year

Engl 203 or 204 Surv. of Eng. Lit.	3	(3,0)	Acct 201 Prin. of Accounting	3	(3,0)
Physical Science†	4		Literature Requirement*	3	(3,0)
Psych 201 Gen. Psychology	3	(3,0)	Physical Science†	4	
RPA 204 Sports in Recreation	3	(2,3)	RPA 203 Per. & Comm. Health	3	(3,3)
Zool 102 Principles of Zoology	2	(2,0)	RPA 205 Prog. Plan. for Rec.	3	(2,3)
or Bot 102 Prin. of Botany	2	(2,0)	AS or MS or Elective	1	
AS or MS or Elective	1			17	
	16				

JUNIOR YEAR

First Semester		
Engl 301 Public Speaking	3	(3,0)
Hort 303 Plant Materials I	3	(2,3)
RPA 302 Camp Org. & Admin.	3	(2,3)
RPA 306 Prin. of Outdoor Ed.	3	(3,0)
Elective	3	
	15	

Second Semester		
Ed 335 Adol. Growth & Develop.	3	(3,0)
Hort 308 Landscape Design	3	(2,3)
RPA 307 Pk. Maint. & Oper.	4	(3,3)
RPA 308 Meth. & Tech. Rec. Leadership	3	(3,0)
Elective	3	
	16	

SUMMER

RPA 405 Field Training in Recreation.... 8

SENIOR YEAR

Ag Ec 352 Public Finance	3	(3,0)
IM 307 Personnel Management	3	(3,0)
RPA 403 Facility & Site Planning	3	(2,3)
RPA 409 Methods of Rec. Research I	3	(3,0)
Elective	3	
	15	

For 426 A Survey of Forest Policy	2	(2,0)
or For 305 Elements of Forestry	2	(2,0)
Pol Sc 302 State & Local Gov.	3	(3,0)
RPA 402 Recreation Admin.	3	(3,0)
RPA 410 Methods of Rec. Research II	3	(3,0)
Soc 331 Urban Sociology	3	(3,0)
Elective	2	
	16	

135 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Two-semester sequences in chemistry, geology, physics, or physical science.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

The programs of the College of Industrial Management and Textile Science embrace three major areas, teaching, research, and public service. The College is responsible for seven graduate programs (two in cooperation with other administrative units), seven undergraduate programs, and a "non credit" series of professional development courses for business and industry. The undergraduate curriculums are in the areas of Accounting, Administrative Management, Economics, Financial Management, Industrial Management, Textile Science, and Textile Chemistry. These curriculums are designed to prepare the students for a variety of careers, as well as to furnish an education on which to build for a lifetime. The curriculums recognize the need for an understanding of the basic principles of science and appreciation for the nature of human beings, and the comprehension of the economic, political, and social environment. Flexibility in course selection and choice of areas for emphasis is made possible by secondary concentrations and minors as indicated.

ACCOUNTING

This curriculum leads to the Bachelor of Science degree in Accounting. The program of courses is designed to prepare students for professional careers in accounting and management. The major study of accounting is well supported by sequential courses in English, mathematics, management, economics, and sociology.

The graduate in Accounting is well prepared for entrance in law school, graduate school, or the practice of accountancy, either public, private, or governmental. The study of Accounting in preparation for a career in other areas of Management will provide mastery over an essential tool which reinforces experience and judgment in the decision-making process.

ACCOUNTING CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Acct 201 Principles of Acct.	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Science Elective†	4	(3,3)	Science Elective†	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	3	(3,0)
	15			17	

SOPHOMORE YEAR

Acct 202 Principles of Acct.	3	(3,0)	Acct 301 Intermediate Acct.	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Literature Requirement*	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Math 207 Multi. Dim. Cal.	3	(3,0)	IM 201 Introd. to Ind. Mgt.	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Literature Requirement*	3	(3,0)
AS or MS or Elective	1		Math 301 Stat. Theory & Meth. I	3	(3,0)
			AS or MS or Elective	1	
	16			19	

JUNIOR YEAR

Acct 302 Intermediate Acct.	3	(3,0)	Acct 305 Income Taxation	3	(3,0)
Acct 303 Cost Acct.	3	(3,0)	Engl 304 Advanced Comp.	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 313 Commercial Law	3	(3,0)
IM 306 Corporation Finan.	3	(3,0)	Mgt Sc 311 Introd. to Econometrics	3	(3,0)
IM 312 Commercial Law	3	(3,0)	Soc 351 Industrial Soc.	3	(3,0)
Approved Elective	1		Approved Elective	3	
	16			18	

SENIOR YEAR

Acct 405 Adv. Fed. Tax	3	(3,0)	Acct 407 Acct. Research	1	(1,0)
Acct 410 Bud. and Exec. Cont.	3	(3,0)	Acct 415 Auditing	3	(3,0)
Acct 411 Advanced Acct.	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
Mgt Sc 414 Stat. Analysis	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)
Approved Elective	3		IM 415 Manag. Dec. Making	3	(3,0)
			Approved Elective	3	
	15			16	

132 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Science elective includes any natural or physical science.

ADMINISTRATIVE MANAGEMENT

The Bachelor of Science degree in Administrative Management is designed for those students interested in careers as professional managers in the less technical areas of management. Such areas include marketing, personnel administration, purchasing, and public administration at the local, state and national levels. In addition, the qualified graduate of this curriculum will have a background suitable for pursuing graduate study in such areas as marketing, transportation, finance, and economics, as well as the behavioral sciences.

The programs of study included in Administrative Management curriculum is designed to provide the student with (1) an appreciation of the social, political, and economic environments in which business firms must operate; (2) knowledge of the functional areas of business, their interrelationship and use of analytical methods in solving problems; and (3) a facility in the use of mathematics, statistics, and the behavioral sciences in performing managerial functions.

ADMINISTRATIVE MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
or Phy Sc 101 Physical Sci. I	4	(3,2)	or Phy Sc 102 Physical Sci. II	4	(3,2)
Engl 101 English Comp.	3	(3,0)	Engl 102 English Comp.	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	Math 102 Math. Analysis II	3	(3,0)
Math 101 Math. Analysis I	3	(3,0)	Pol Sc 201 Introd. to Pol. Sci. II	3	(3,0)
Pol Sc 101 Introd. to Pol. Sci. I	3	(3,0)	Elective	1	
Elective	1		Elective	3	
	17			17	

SOPHOMORE YEAR

Acct 201 Prin. of Acct.	3	(3,0)	Acct 202 Prin. of Acct.	3	(3,0)
Econ 201 Prin. of Econ.	3	(3,0)	Econ 202 Prin. of Econ.	3	(3,0)
Literature Requirement*	3	(3,0)	IM 201 Introd. to Ind. Mgt.	3	(3,0)
Math 203 Elem. Stat. Infer.	3	(3,0)	IM 299 Computer Prog. 1	1	(0,3)
Soc 201 Introd. Soc.	3	(3,0)	Psych 201 General Psychology	3	(3,0)
Elective	1		Soc 202 Social Problems	3	(3,0)
			Elective	1	
	16			17	

JUNIOR YEAR

Acct 303 Cost Accounting	3	(3,0)	IM 308 Marketing Strategy	3	(3,0)
Econ 301 Econ. of Labor	3	(3,0)	IM 313 Coml. Law	3	(3,0)
IM 304 Quality Control†	3	(3,0)	Mgt Sc 310 Introd. to Mgt. Science	3	(3,0)
IM 306 Corporate Fin.	3	(3,0)	Pol Sc 321 Gen. Public Adm.†	3	(3,0)
IM 312 Coml. Law	3	(3,0)	Soc 331 Urban Sociology	3	(3,0)
			or IM 307 Personnel Mgt.	3	(3,0)
	15			15	

SENIOR YEAR

Acct 410 Budget & Exec. Con.	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Engl 304 Adv. Composition	3	(3,0)	IM 410 Marketing Research I	1	(1,0)
IM 402 Op. Plan. & Cont.	3	(3,0)	or IM 407 Dir. Research	1	(1,0)
IM 418 Mgt. Information Sys.	3	(3,0)	IM 412 Marketing Anal. II†	3	(3,0)
or IM 405 Econ. of Trans.	3	(3,0)	IM 415 Manag. Dec. Making	3	(3,0)
Elective	6		IM 499 Comp. Prog. II	1	(0,3)
			Mgt Sc 414 Stat. Anal.	3	(3,0)
			or IM 404 Managerial Econ.	3	(3,0)
			Elective	6	
	18			17	

132 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Students who are concentrating their electives in Textiles should consult the Director of Textile Undergraduate Education for alternative course recommendations.

ECONOMICS

The curriculum leading to the Bachelor of Arts degree in Economics is designed to combine a broad general education with a thorough understanding of economics.

The economics curriculum is administered in the College of Industrial Management and Textile Science. Although separate and distinct from the Bachelor of Arts program in the College of Liberal Arts, it shares several ingredients with that program. The two programs share an identical freshman year sequence, identical minor concentrations in most cases, and many of the same approved electives.

The degree requirements, effective for freshmen entering 1967-68 and thereafter, are given below. The Bachelor of Arts degree in Economics requires 130 semester hours for graduation; and whenever scheduling permits, the student will be required to take the courses in the sequence given. The curriculum shown, however, can be considered adequate preparation for graduate study in economics only if it is taken with the mathematics minor.

ECONOMICS CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Math 101 Math. Analysis I‡	3	(3,0)	Math 102 Math. Analysis II‡	3	(3,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
Natural Science†	4 — 3		Natural Science†	4 — 3	
AS or MS or Elective	1		AS or MS or Elective	1	
	18 — 17			18 — 17	

Sophomore Year

Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Hist 101 American History	3	(3,0)	Hist 102 American History	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 203 Elem. Stat. Inference‡	3	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			17	

Junior Year

Acct 201 Prin. of Accounting	3	(3,0)	Econ 407 Natl. Income and Empl. Anal.	3	(3,0)
Econ 314 Intermed. Econ. Theory	3	(3,0)	Humanities¶	3	
Humanities¶	3		Major	3	
Major	3		Minor§	6	
Minor§	3				
	15			15	

SENIOR YEAR

First Semester		*Second Semester*	
Major	6	Major	6
Minor	6	Approved Elective	11 — 10
Approved Elective	4 — 3		17 — 16
	16 — 15		

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Election of a two-semester sequence of the same science is required.

‡ The sequence of Math 101, 102, 203, and 106 may be replaced by Math 106, 108, and 301, or by Math 106, 108, and Ex St 301.

§ Where the student selects a minor which carries prerequisites, the prerequisite courses will be counted as approved electives.

¶ Courses for the Humanities requirement may not be selected from the minor field. Humanities include art, English, foreign language, music, philosophy, and religion.

Note: Those seeking teacher certification will be required to complete more than 130 semester hours.

Twenty-four semester hours above the sophomore level are required including Econ 314 and 407. Courses must also include 9 semester hours selected from Econ 302, 403, 404, 410, 412, and 420. The remaining hours may be selected from Econ 301, 302, 305, 306, 308, 309, 403, 404, 409, 410, 412, 413, 414, 416, 419, 420, 421, 422, 423, 424, Ex St 462, Mgt Sc 311, IM 404, 405, 406, and Ag Ec 456. (Econ 314 should be scheduled to follow immediately after Econ 202.)

MINOR CONCENTRATION

A major in economics must select a minor concentration under one of the options as follows:

(1) Secondary (minor) concentration as listed:

- Accounting (to include Acct 202, 301, 302, 303, 410)
- Biology
- Chemistry
- English
- Geology
- History
- Mathematics
- Modern Languages
- Philosophy
- Physics
- Political Science
- Psychology
- Sociology

Students who consider the Bachelor of Arts curriculum in Economics and desire to go into secondary school teaching should elect to take the degree in Education with a teaching area in Economics. The courses will be those required for teaching certificates as specified by the South Carolina Department of Education as well as those economics courses required for an Economics major.

Specific requirements for most minors may be found under the section on the College of Liberal Arts and the College of Physical, Mathematical, and Biological Sciences, Bachelor of Arts curriculum. Requirements for a major in Education with a teaching area in Economics are shown under the College of Education.

A minor in Economics is provided for other degree programs consisting of 15 hours above the sophomore level which must include Econ 314 and 407.

(2) The *"Cluster Minor."* This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the "Cluster Minor" is 15 semester credits in courses numbered higher than 300 (except where noted differently), chosen according to one of the plans as follows:

Group I—Social Sciences*
- History
- Political Science
- Psychology
- Sociology

Group II—Philosophy and Religion

Group III—Administration *
- Accounting
- Industrial Management

Group IV—Life Sciences †
- Bacteriology
- Botany
- Genetics
- Zoology

Group V—Physical Sciences †
- Chemistry
- Geology
- Physics

APPROVED ELECTIVES

A list of approved electives for both degree and quality requirements may be obtained from the departmental secretary or from an adviser.

FINANCIAL MANAGEMENT

The curriculum for the Bachelor of Science degree in Financial Management provides the student with a course of study in preparation for a career in such areas as banking, insurance, brokerage and related activities. The student should be well prepared to serve on the financial staff of practically any business firm for the purpose of planning, providing, and controlling the capital of the firm. This curriculum should also prepare the student for service in government and agencies and programs of government. The graduate with this degree should be adequately prepared for entrance in law or graduate school.

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* At least two courses must be taken in each subject chosen.

† No course in the 100 series is acceptable toward the cluster minor and not more than two courses in the 200 series. At least two courses must be taken in each subject chosen.

The course work consists largely of courses in English, Mathematics, Accounting, Economics, Management, and the Social Sciences. The special interests of the individual student may be pursued through elective credit.

FINANCIAL MANAGEMENT CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Acct 201 Prin. of Acct.	3	(3,0)	Acct 202 Prin. of Acct.	3	(3,0)
Engl 101 English Comp.	3	(3,0)	Econ 201 Prin. of Econ.	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
IM 201 Introd. to Ind. Mgt.	3	(3,0)	Math 102 Math. Analysis II†	3	(3,0)
Math 101 Math. Analysis I†	3	(3,0)	Pol Sc 101 Introd. to Pol. Sci. I	3	(3,0)
Elective	1		AS or MS or Elective	1	
	16			16	

Sophomore Year

Acct 301 Intermediate Acct.	3	(3,0)	Acct 302 Intermediate Acct.	3	(3,0)
Econ 202 Prin. of Econ.	3	(3,0)	Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 203 Elem. Stat. Inf.†	3	(3,0)	Psych 201 General Psych.	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Elective	3	
Elective	1			15	
	16				

Junior Year

Acct 303 Cost Acct.	3	(3,0)	Acct 305 Income Taxation	3	(3,0)
Econ 306 Risk & Insurance	3	(3,0)	Econ 302 Money and Banking	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 306 Corp. Finance	3	(3,0)
IM 308 Marketing Strategy	3	(3,0)	IM 307 Personnel Mgt.	3	(3,0)
IM 312 Coml. Law	3	(3,0)	IM 313 Coml. Law	3	(3,0)
Soc 351 Ind. Soc.	3	(3,0)	Elective	3	
	18			18	

Senior Year

Acct 410 Bud. & Exec. Cont.	3	(3,0)	Acct 415 Auditing	3	(3,0)
Econ 422 Monetary Theory & Pol.	3	(3,0)	Econ 412 Int. Trade	3	(3,0)
Engl 304 Adv. Composition	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
IM 415 Manag. Dec. Making	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Elective	6		Elective	6	
	18			15	

132 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Credits earned in Math 106, 108, 207, 301, and Mgt Sc 414 may be substituted toward Math 101, 102, 203, and eight elective credits. See class adviser.

INDUSTRIAL MANAGEMENT

This curriculum is designed to adequately prepare students for positions of major responsibility in industry, business, government or further academic study. During the first year education in the mathematical and physical sciences is emphasized. In the second, third, and senior years the student's work expands into the areas of industrial engineering, finance, management and the social sciences. As preparation for careers in professional management, the Industrial Management curriculum is predicated on the philosophy that the individual must manage first himself, coupling this objective with the acquisition of a general education and then acquiring a mastery of the "tools" of management.

INDUSTRIAL MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 Gen. Chemistry	4	(3,3)	Ch 102 Gen. Chemistry	4	(3,3)
EG 103 Engr. Com.	3	(1,6)	Engl 102 English Composition	3	(3,0)
or Hist 173 Western Civilization	3	(3,0)	Hist 173 Western Civilization	3	(3,0)
Engl 101 English Composition	3	(3,0)	or EG 103 Engr. Com.	3	(1,6)
IM 100 Introd. to Ind. Mgt.	0	(1,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. and Wave Phen.	3	(3,0)
Elective	1		Elective	1	
	15			18	

SOPHOMORE YEAR

First Semester			*Second Semester*		
Acct 201 Prin. of Accounting	3	(3,0)	Acct 202 Prin. of Accounting	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Math 207 Multi. Dim. Cal.	3	(3,0)	IM 201 Introd. to Ind. Mgt.	3	(3,0)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	IM 299 Computer Prog. I	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Literature Requirement*	3	(3,0)
Soc 201 Introd. Soc.	3	(3,0)	Math 301 Stat. Theory & Methods I	3	(3,0)
Elective	1		Elective	1	
	17			17	

JUNIOR YEAR

First Semester			*Second Semester*		
Acct 303 Cost Accounting	3	(3,0)	IM 304 Quality Control	3	(3,0)
Econ 314 Inter. Econ. Theory	3	(3,0)	IM 308 Marketing Strategy	3	(3,0)
IE 307 Survey of Engr.	3	(3,0)	Mgt Sc 311 Introd. to Econ.	3	(3,0)
IM 322 Legal Env. of Bus.	3	(3,0)	Soc 351 Ind. Soc.	3	(3,0)
Area Concentration†	3		Area Concentration†	3	
or Technical Elective	3		or Technical Elective	3	
Elective	3		Elective	3	
	18			18	

SENIOR YEAR

First Semester			*Second Semester*		
Acct 410 Bud. and Exec. Cont.	3	(3,0)	IM 402 Op. Plan. and Cont.	3	(3,0)
Engl 304 Adv. Composition	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)
IM 408 Work Simp. & Stand.	3	(3,0)	IM 407 Directed Research	1	(1,0)
or IM 418 Mgt. Inform. Sys.	3	(3,0)	or IM 410 Marketing Research I	1	(1,0)
Mgt Sc 414 Stat. Analysis	3	(3,0)	IM 409 Mgt. Simulation	0	(0,3)
Area Concentration†	3		IM 415 Manag. Dec. Making	3	(3,0)
or Technical Elective	3		IM 499 Computer Prog. II	1	(0,3)
	15		Area Concentration†	3	
				14	

132 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† A student not selecting a specified area concentration must select twelve hours from the areas of Industrial Management, Accounting, Hospital Administration, Management Science, Economics, Mathematics, Computer Science, Engineering, Textiles, Sociology, Chemistry or Physics. Electives *need not* be concentrated in a single discipline. However, if a student does not complete the area concentration as specified, then completed courses in such areas as political science, history, and psychology, must count as electives—not technical electives.

Area Concentrations

During the junior and senior years the student may select courses from *one* of the following areas for the purpose of emphasizing a particular area of the curriculum. Area concentrations constitute 12 credits and may be extended to 18 credits with the approval of the student's major adviser.

A. Ceramics
B. Economics
C. Defense Studies
D. Health and Hospital Administration
E. Human Resources Management
F. Industrial Engineering
G. Industrial Statistics
H. Management Science
I. Marketing Analysis
J. Regional Science
K. Textiles

TEXTILE CHEMISTRY

The Textile Chemistry curriculum prepares students for a wide variety of positions in the textile-fiber-polymer complex of industries that provide so much of the industrial income of the Southeast. The program gives excellent preparation for graduate study in many fields including the sciences, engineerings, management, and the interdisciplines such as textile, fiber, and polymer science. In his first two years, the student acquires the firm foundation in chemistry, physics, mathematics, and English essential to any serious study of science. In his third and fourth years, the student continues his studies of chemistry and begins to apply his knowledge in studies of ploymer and fiber science, dyeing, finishing, yarn and fabric formation, and textile structures. Supporting courses in the humanities, English, and economics are included.

A total of 132 semester hours is required for graduation; of these, 32 semester hours are electives which may include up to ten semester hours of Air Science or Military Science. At least 20 semester hours of electives will form a coherent group in an area of particular interest and need to the student in his scientific and professional development. Ordinarily these courses will be junior or senior level courses in textile science, textile chemistry, other sciences, engineering, mathematics, or management. In the second semester of his sophomore year, the student, with the advice and consent of the Head of the Textile Department or the Director of Undergraduate Textile Education, will develop a study plan and will select these elective courses so as to maximize his training and development in his chosen field of study.

Senior students are encouraged to participate in original research and seminar programs. These activities, for which academic credits are given, introduce the student to scientific research and development in the chemistry of textiles, fibers, and polymers.

The Textile Department offers the degrees, Master of Science in Textile Chemistry, Master of Science in Textile Science, and Doctor of Philosophy in Textile and Polymer Science, and in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

TEXTILE CHEMISTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 172 or 173 West. Civilization	3	(3,0)	IM 299 Comp. Program. I	1	(0,3)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Text 122 Introd. to Textiles	1	(1,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

First Semester			*Second Semester*		
Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 225 Org. Chem. Lab.	2	(0,6)	Ch 226 Org. Chem. Lab.	2	(0,6)
Literature Requirement[*]	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 223 Electron Phys. Lab.	1	(0,3)	Elective[†]	2	
AS or MS or Elective	1		AS or MS or Elective	1	
	17			16	

JUNIOR YEAR

First Semester			*Second Semester*		
Ch 331 Physical Chemistry	3	(3,0)	Ch 332 Physical Chemistry	3	(3,0)
Econ 201 Principles of Econ.	3	(3,0)	Engl 304 Adv. Composition	3	(3,0)
TC 315 Introd. Poly. Sci. & Engr.	3	(3,0)	TC 316 Chem. Prep. of Text.	3	(2,3)
TC 317 Polymer & Fiber Lab.	1	(0,3)	Text 306 Yarn Formation	3	(3,0)
Electives[†]	6		Electives[†]	6	
	16			18	

SENIOR YEAR

First Semester			*Second Semester*		
TC 457 Dyeing & Fin. I	3	(3,0)	TC 458 Dyeing & Fin. II	3	(3,0)
TC 459 Dyeing and Fin. Lab. I	1	(0,3)	TC 460 Dyeing and Fin. Lab. II	1	(0,3)
Text 313 Fabric Formation	3	(3,0)	Text 322 Prop. of Text. Structure	3	(2,3)
Text 321 Fiber Science	3	(2,3)	Electives[†]	10	
Electives[†]	6			17	
	16				

132 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Class advisers have lists of approved electives and will suggest sequences of courses.

TEXTILE SCIENCE

The Textile Science curriculum prepares students for a wide variety of positions in research and development, production, standards, and management in the textile-fiber-polymer complex of industries and in related industries. The program gives excellent preparation for graduate study in many fields. The first two years are devoted to the study of the chemistry, physics, mathematics, and English essential to the study of textile, fiber, and polymer science. In his third and fourth years, the student studies the science and technology necessary for development and production of fibers, yarns, woven, and nonwoven textile structures, and synthetic polymers.

A total of 132 semester hours is required for graduation; of these, 34 semester hours are electives which may include up to ten semester hours of Air Science or Military Science. At least 20 semester hours of electives will form a coherent group in an area of particular interest and need to the student in his scientific and professional development. Ordinarily, these courses will be junior or senior level courses in textile science, textile chemistry, other sciences, engineering, mathematics, or management. In the second semester of his sophomore year, the student, with the advice and consent of the Head of the Textile Department or the Director of Undergraduate Textile Education, will develop a study plan and will select these elective courses so as to maximize his training and development in his chosen field of study.

Senior students are encouraged to participate in original research and seminar programs. These activities, for which academic credits are given, introduce the student to scientific research and development in textiles, fibers, and polymers.

The Textile Department offers the degrees, Master of Science in Textile Science, Master of Science in Textile Chemistry, and Doctor of Philosophy in Textile and Polymer Science, and, in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

TEXTILE SCIENCE CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 173 Western Civilization	3	(3,0)	IM 299 Comp. Program. I	1	(0,3)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Text 122 Introd. to Textiles	1	(1,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

Sophomore Year

Literature Requirement*	3	(3,0)	Econ 201 Prin. of Economics	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elect. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
TC 303 Text. Chemistry	3	(3,0)	TC 304 Text. Chemistry	3	(3,0)
TC 305 Text. Chem. Lab.	1	(0,3)	TC 306 Text. Chem. Lab.	1	(0,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

Junior Year

Text 301 Fiber Processing I	3	(2,3)	Engl 304 Adv. Composition	3	(3,0)
Text 311 Fabric Development I	3	(2,3)	Text 302 Fiber Processing II	3	(2,3)
Text 321 Fiber Science	3	(2,3)	Text 312 Fabric Development II	3	(2,3)
Electives†	9		Text 322 Prop. of Text. Struct.	3	(2,3)
			Electives†	6	
	18			18	

Senior Year

TC 315 Introd. Poly. Sci. & Engr.	3	(3,0)	TC 458 Dyeing and Fin. II	3	(3,0)
TC 317 Polymer & Fiber Lab.	1	(0,3)	TC 460 Dyeing and Fin. Lab. II	1	(0,3)
Text 403 Fiber Processing III	3	(2,3)	Text 414 Nonwoven & Knit Struct.	3	(3,0)
Text 411 Fabric Development III	3	(2,3)	Electives†	9	
Electives†	6				
	16			16	

132 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Class advisers have lists of approved electives and will suggest sequence of courses.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts, in addition to its six major curriculums leading to the degree of Bachelor of Arts, makes indispensable contributions to the programs of all other divisions of the University, including nearly all the instruction in the humanities and the social sciences. Major concentrations may be elected in English, History, Modern Languages, Political Science, Psychology, and Sociology; minor concentrations are offered in these disciplines and in Philosophy. In cooperation with other Colleges of the University, minor concentrations are also available in Biology, Chemistry, Economics, Fine Arts, Geology, Mathematics, and Physics. Supporting work is offered in Music and in interdisciplinary humanistic studies.

The College of Liberal Arts offers programs leading to graduate degrees in English and in History.

BACHELOR OF ARTS CURRICULUM

GENERAL INFORMATION

The curriculum leading to the degree of Bachelor of Arts is designed to meet the needs of students who desire a broad general education, with emphasis upon the humanities and the social sciences, as a preparation for intelligent citizenship, for general commercial and industrial life, for government service, and for teaching. This curriculum also provides excellent background for the study of law or journalism.

As soon as feasible in his college career, and not later than the end of his sophomore year, the student seeking the Bachelor of Arts degree will select a major and a minor field of concentration from the following areas:

Major

English
History
Modern Languages
Political Science
Psychology
Sociology

Minor

Biology
Chemistry
Economics
English
Fine Arts
Geology
History
Mathematics
Modern Languages
Political Science
Philosophy
Physics
Psychology
Sociology
"Cluster Minor"

To fulfill requirements for a major concentration, a student takes 24 semester hours credit from courses above the sophomore level, including certain courses specified by the major department; the minor concentration requires 15 credits from courses above the sophomore level, including certain specified courses.

The total number of semester credits required for the degree is 130; of these, at least 12 should be earned in humanities courses numbered 300 or higher, and at least 12 in Social Sciences courses numbered 300 or higher. The humanities are for this purpose considered to include Art, English, Languages, Music, Philosophy, and Religion as well as courses entitled Humanities; the Social Sciences are here considered to include Economics, Geography, History, Political Science, Psychology, and Sociology.

Students in the Bachelor of Arts program who expect to teach in the public schools may elect Education courses required for teaching certificates by the South Carolina State Department of Education, such courses to be approved by their own departmental advisers.

BACHELOR OF ARTS DEGREE

BASIC CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Math 101 Math. Analysis I	3	(3,0)	Math 102 Math. Analysis II	3	(3,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
Natural Science†	3 — 4		Natural Science†	3 — 4	
AS or MS or Elective	1		AS or MS or Elective	1	
	17 — 18			17 — 18	

SOPHOMORE YEAR

Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Approved Electives	9		Approved Electives	9	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	12
Approved Electives	8 — 6	Approved Electives	6
	17 — 15		18

SENIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	9
Approved Electives	6 — 5	Approved Electives	5 — 6
	15 — 14		14 — 15

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† A two-semester sequence of the same science (Chemistry, Physics, Geology, or Physical Science), *or* Biol 101, Zool 102, 104, or Bot 102, 104.

MAJOR CURRICULUMS IN THE COLLEGE OF LIBERAL ARTS

ENGLISH

For a *major* concentration in English, the recommended program of study consists of the courses stipulated in the basic curriculum and 24 semester hours of English, arranged as follows:

Group I—Engl 402 or 404, 405, 422 or 423.

Group II—Nine semester credits according to one of the following plans:

(A) Engl 461; 425 or 427 or 429 or 431 or 437; 416 or 438 or 439.
(B) Engl 462; 409 or 443; 445 or 446.
(C) Engl 461, 462, and one of these courses: 409, 410, 413, 416, 424, 425, 427, 429, 431, 437, 438, 439, 443, 445.

Group III—Six additional semester credits from courses numbered above 400.*

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required. English majors are expected to complete Hist 361, 363, and to complete the third year of a foreign language or the second year of two foreign languages. Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

HISTORY

The recommended program of study consists of the required courses in the Bachelor of Arts curriculum; 24 semester credits in the Social Sciences † at the 100-200 level including at least 12 credits from Hist 101, 102, 171, 172, 173; completion of the third year of a foreign language; Hist 499; and 21 additional semester credits in history, arranged as follows:

Group I—At least six credits from these courses: Hist 306, 307, 313, 314, 315, 410, 411, 412, 413, 414.

Group II—At least six credits from these courses: Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—At least six credits from these courses: Hist 331, 332, 340, 341, 342, 441.

History majors become eligible to take Hist 499 when they have completed 96 semester hours and at least 5 courses in history at the 300-400 level (excluding Hist 301).

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* English 332 may be included in this group by special arrangement with the Head of the Department of English.

† Economics, Geography, History, Political Science, Psychology, Sociology.

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

MODERN LANGUAGES

A student may elect a major concentration in a single language or a concentration split between two languages; however, the department recommends a minor concentration outside the Department of Languages.

I. The recommended program of study for a major in French, German, or Spanish consists of the courses stipulated in the basic Liberal Arts curriculum and 24 hours in the language arranged as follows: 303, 304, 305, and either 306, 307, or 308, plus 12 semester hours on the 400 level.

II. The recommended program for a split major in Modern Languages consists of the courses stipulated in the basic Liberal Arts curriculum, 18 semester hours in the primary language, and 12 semester hours in the secondary language, arranged as follows:

Primary Language. 303, 304, 305, and either 306, 307, or 308, plus 6 semester hours on the 400 level.

Secondary Language. 12 semester hours from courses numbered higher than 300.

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

POLITICAL SCIENCE

For a major concentration in Political Science, the recommended program of study consists of the required courses in the Bachelor of Arts curriculum; Pol Sc 201, 101 (formerly 202) or 301; Ex St 301; and 24 semester hours of Political Science drawn from at least four of these fields:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321, 422, 423, 426, 428
3. Constitutional Law—Pol Sc 331, 432, 433, 434
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 465, 469, 473
7. Comparative Governments—Pol Sc 371, 372, 473, 479

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

PSYCHOLOGY

The recommended program of study for a major concentration in Psychology consists of the required courses in the Bachelor of Arts curriculum, Psych 201 and 202, Math 203 or Ex St 301, Psych 363, and 21 additional hours of Psychology drawn from the following courses:

Psych 302, 321, 331, 341, 351, 361, 363, 380, 401, 402, 403, 422, 471, 475, 490, 498, 499, and Comp Sc 205.

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

SOCIOLOGY

The recommended program of study for a major concentration in Sociology consists of the required courses in the Bachelor of Arts curriculum, Soc 201, 206, Econ 201, 202, Phil 201, 302, Pol Sc 301, Ex St 301, Soc 411, 421, and 18 additional hours drawn from these courses: Pol Sc 341, Soc 306, 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 393, 411, 421, 431, 441, 451, 481, 499, RS 359, 401.

MINOR CONCENTRATIONS

Students seeking the Bachelor of Arts degree may choose one of several minor concentrations available. The requirements for each area are detailed below.

Biology. A minor concentration in Biology requires 15 semester credits in the biological sciences numbered higher than 200.

Chemistry. A minor concentration in Chemistry requires Ch 101, 102, and 15 additional credits in chemistry, the courses to be selected in consultation with the Department of Chemistry.

Economics. A minor concentration in Economics requires Econ 201, 202, 314, 407, and 9 credits from these courses: Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

English. A minor concentration in English requires 15 semester credits in English above the sophomore level, arranged as follows:

Group I—Engl 405 and either 422 or 423.

Group II—One of these courses: Engl 402, 404, 410, 413, 424, 425, 427, 429, 431, 437, 443, 445, 446, 461, 462.

Group III—Six additional credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts consists of Hum 201-202 or Arch 101-102 and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected:

Architectural History (all courses);
Arch 415, 416;
Engl 305, 308, 310, 311, 331, 332, 333;
Hum 203;
Mus 151, 152, 205, 206, 210, 251, 252, 305, 306, 311, 315, 316, 362, 365, 421, 422, 423;
Phil 305;
Visual Studies (all courses).

Geology. A minor concentration in Geology requires 15 semester credits from the following courses: Geol 201, 202, 306, 309, 402, 403, 404, 411, 412.

History. A minor concentration in History requires Hist 101, 102, and 15 additional credits in History, including at least one course from each of these groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413, 414.
Group II—Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.
Group III—Hist 331, 332, 340, 341, 342, 441.

Mathematics. A minor concentration in Mathematics requires Math 106, 108, 206, and 9 additional credits in mathematics, including at least two of these courses: Math 208, 295, 301, Comp Sc 205, and any 400-level course in Mathematics or Computer Science.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300, including at least one course on the 400 level.

Philosophy. A minor concentration in Philosophy requires Phil 201, 302, and 15 semester credits from the following courses: Phil 211, 303, 304, 305, 309, 312, 318, 322, 344, 422, 425.

Physics. A minor concentration in Physics requires Phys 122 and 15 additional semester credits in Physics, including Phys 221, 222.

Political Science. A minor concentration in Political Science requires Pol Sc 101 (formerly 202) or 301; 201, and 15 additional semester credits selected from at least three of the fields of Political Science listed above under the major curriculum for Political Science.

Psychology. A minor concentration in Psychology requires Psych 201, 202, and 15 semester credits from the following courses: Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 475, 498; Ed 302 and 335 (if taken prior to fall 1968); Comp Sc 205.

Sociology. A minor concentration in Sociology requires Soc 201, 206, and 15 semester credits from the following courses: Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 393, 411, 421, 431, 441, 451, 481, 499, Pol Sc 341, RS 359, 401.

The *"Cluster Minor."* This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the "Cluster Minor" is 15 semester credits in courses numbered higher than 300 (except where noted differently), chosen according to one of the plans listed below. Courses within the student's major area may not be included in the "Cluster Minor."

- Group I—Social Sciences*
  - Economics
  - History
  - Political Science
  - Psychology
  - Sociology
- Group II—Philosophy and Religion
- Group III—Administration*
  - Accounting
  - Economics
  - Industrial Management
- Group IV—Life Sciences†
  - Bacteriology
  - Botany
  - Genetics
  - Zoology
- Group V—Physical Sciences†
  - Chemistry
  - Geology
  - Physics

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* At least two courses must be taken in each subject chosen.

† No course in the 100 series is acceptable toward the cluster minor and not more than two courses in the 200 series. At least two courses must be taken in each subject chosen.

APPROVED ELECTIVES FOR STUDENTS IN THE COLLEGE OF LIBERAL ARTS

Class advisers in the College of Liberal Arts will normally approve the following courses as electives, but the Dean of Liberal Arts retains the prerogative of limiting the total number of credits that may be approved in a discipline or area:

All courses offered in the College of Liberal Arts and the College of Physical, Mathematical, and Biological Sciences except: Ch 450; Engl 111; Geol 406; Phys 460; Psych 211; Math 100, 115, 116, 215, 216;

All courses in Economics;
All courses in Accounting;
Architectural History courses to a limit of 12 credits;
Arch 253, 415, 416;
Comp Sc 205, 421;
Cr Ar 101, 102;
Education courses required for certification in South Carolina (other courses by special arrangement);
Ex St 301, 462;
In Ed 204, 440;
IM 201, 299, 307, 312, 313, 322, 405;
Mgt Sc 311, 413, 414;
RPA 304;
RS 301;
Text 333;
Visual Studies courses to a limit of 9 credits.

COLLEGE OF NURSING

The College of Nursing provides two programs designed to prepare undergraduate men and women students for a career in nursing.

The program leading to the Bachelor of Science in Nursing degree is designed to prepare nurses for the practice of professional nursing in a variety of settings—hospitals, industry, clinics, and public health agencies. The program offers the foundation for graduate study in nursing, and an unlimited opportunity for men and women for sound career development in professional nursing. The baccalaureate program is four academic years and one six-week summer term in length. The student is enrolled in liberal arts and basic science courses during the first two years. These courses are arranged sequentially in order to provide the foundation for professional courses which are planned for the junior and senior years. In addition, advanced liberal arts courses are taken during the junior and senior years. Clinical nursing experiences under the guidance of the College of Nursing faculty will take place with patients in the Greenville Hospital System and with local public health agencies.

The program leading to the Associate in Arts degree is designed to prepare the graduate at the technical level of nursing for direct patient-centered nursing under supervision in hospitals and other institutional health centers. The associate degree program may be completed in two academic years. The nursing major accounts for fifty percent of the total credit hours. This technical background is balanced by courses in the biologic and social sciences and the humanities. Clinical learning experiences planned as an integral part of the program, under the guidance of the College of Nursing faculty, take place with patients in the Anderson Memorial Hospital.

Students enrolled in the College of Nursing must meet the course requirements as described for each program in order to qualify for the degree and for licensure to practice Nursing.

BACHELOR OF SCIENCE IN NURSING CURRICULUM

FRESHMAN YEAR

First Semester		*Second Semester*	
Biol 101 Prin. of Biology	3 (3,0)	Ch 102 General Chemistry	4 (3,3)
Ch 101 General Chemistry	4 (3,3)	Engl 102 English Composition	3 (3,0)
Engl 101 English Composition	3 (3,0)	Math 102 Math. Analysis II	3 (3,0)
Math 101 Math. Analysis I	3 (3,0)	Zool 102 Prin. of Zoology	2 (2,0)
Nurs 100 Orientation	1 (1,0)	Zool 104 Lab. Exer. in Zoology	1 (0,2)
	14		13
Option: Modern Language	4 (3,1)	Option: Modern Language	4 (3,1)

SOPHOMORE YEAR

Bioch 210 Elem. Biochem.	4 (3,3)	Math 203 Elem. Statis. Inference	3 (3,0)
Literature Requirement*	3 (3,0)	Nurs 207 Dynamics of Human Relations	3 (2,3)
Micro 305 Gen. Microbiology	4 (3,3)	Psych 211 Growth & Develop.	3 (3,0)
Psych 201 Gen. Psych.	3 (3,0)	Soc 201 Introd. Soc.	3 (3,0)
Zool 461 Anatomy	3 (3,0)	Zool 460 General Physiology	3 (2,3)
	17		15

SUMMER (FIRST SESSION)

Nurs 208 Problem Solving in Nursing	3 (2,3)
History Elective	3 (3,0)
	6

JUNIOR YEAR

First Semester		*Second Semester*	
Nurs 309 Human Values in Nurs.	3 (3,0)	Nurs 310 Perspectives in Nursing Intervention	3 (3,0)
Nurs 311 Nurs. During Alterations in Life Patterns	4 (1,9)	Nurs 312 Nurs. of Acute and Chronically Distressed	4 (1,9)
Nurs 313 The Prom. of Health	3 (2,3)	Nurs 314 Nursing in the Home	3 (2,3)
Nutr 451 Human Nutrition	3 (3,0)	Soc 311 The Family	3 (3,0)
Soc 202 Social Problems	3 (3,0)	Elective†	3 (3,0)
	16		16

SENIOR YEAR

First Semester		*Second Semester*	
Nurs 415 Nurs. as a Social Force	3 (3,0)	Nurs 422 Cur. Research in Nurs.	3 (3,0)
Nurs 417 Intensive Nursing	4 (1,9)	Nurs 425 Independent Study in Nursing	7(3,12)
Nurs 419 The Multiprob. Family	3 (2,3)	Psych 302 Social Psychology	3 (3,0)
Nurs 421 Hist. & Philoso. of Nurs.	3 (3,0)	Elective†	3 (3,0)
Elective	3 (3,0)		
	16		16

129 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Electives from the following: Humanities, Literature, Philosophy, Music.
Note: Nurs 207 and 208 open to students enrolled in baccalaureate degree program only.
1.80 grade-point ratio required for registration in nursing courses 300 and above.

ASSOCIATE IN ARTS IN NURSING CURRICULUM

FIRST YEAR

First Semester		*Second Semester*	
Engl 101 English Composition	3 (3,0)	Engl 102 English Composition	3 (3,0)
Nurs 100 Orientation	1 (1,0)	Nurs 102 Fundamentals of Nurs. II	6 (3,9)
Nurs 101 Fundamentals of Nurs. I	6 (3,9)	Nurs 106 Integrated Science II	4 (3,2)
Nurs 105 Integrated Science I	4 (3,2)	Psych 201 Gen. Psychology	3 (3,0)
Elective*	3		
	17		16

SECOND YEAR

First Semester		*Second Semester*	
Nurs 200 Maternal & Child Health Nursing	5 (3,6)	Engl 301 Public Speaking	3 (3,0)
Nurs 201 Major Health Problems I	5 (3,6)	Nurs 202 Major Health Prob. II	5 (3,6)
Psych 211 Growth and Develop.	3 (3,0)	Nurs 203 Major Health Prob. III	5 (3,6)
Soc 201 Introd. Soc.	3 (3,0)	Nurs 204 Nursing Seminar	1 (1,0)
		Elective*	3 (3,0)
	16		17

66 Total Semester Hours

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* Electives: Consult catalog or adviser.

COLLEGE OF PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES

The College of Physical, Mathematical, and Biological Sciences, attuned to the times and its needs, offers nine major curriculums leading to the degree of Bachelor of Science. These are Botany, Chemistry, Geology, Mathematics, Medical Technology, Microbiology, Physics, Pre-medicine and Pre-dentistry, and Zoology.

In addition, a curriculum in Arts and Sciences, with a major emphasis in either Chemistry, Geology, Mathematics, or Physics can be pursued. The fulfillment of the requirements of this curriculum results in a Bachelor of Arts degree.

Not only are the departments in the College of Physical, Mathematical, and Biological Sciences concerned with their own programs but they work closely with the other academic departments in the University. This interweaving of the Physical, Mathematical and Biological Sciences with other disciplines, such as economics, engineering, management, and others, allows a student greater flexibility and responsibility in designing his own program.

BACHELOR OF ARTS CURRICULUM

The curriculum leading to the Bachelor of Arts degree is designed to meet the needs of those students who desire a broad general education. The first two years are spent in introductory work in various areas in order to give the student breadth of view. This type of background enables the student to take a more intelligent part in the selection of his major and minor fields of concentration. The major areas in the College of Physical, Mathematical, and Biological Sciences are Chemistry, Geology, Mathematics, and Physics.

There are a great number of choices in the minor area from the different academic departments in the University. Thus, a student has a larger degree of flexibility and responsibility in designing his curriculum in the Bachelor of Arts program. The minor fields are:

Biology
Chemistry
Economics
English
Fine Arts
Geology
History
Mathematics
Modern Languages
Philosophy
Physics
Political Science
Psychology
Sociology

Furthermore, a cluster minor may be taken. The cluster minor concentration should consist of 15 semester credits in courses numbered higher than 300 (with some exceptions). The subject area of the major should be excluded from the grouping in the minor. The groups available in the cluster minor are:

Group I—Social Sciences
Group II—Philosophy and Religion
Group III—Fine Arts
Group IV—Administration
Group V—Life Sciences

The major concentration requires 24 semester hours and the minor 15 semester hours above the sophomore level unless otherwise indicated. These fit in the basic curriculum for the three upper-class years with minor variations depending on the specific major or minor selected. Consequently, a student not positive of his major or minor field has the advantage of making his decision while in the curriculum with a minimum loss of credit.

MAJOR FIELDS OF CONCENTRATION

CHEMISTRY

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

Ch 223 Organic Chemistry†	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 228 Organic Chem. Lab.	1	(0,3)
Literature Requirement*	3	(3,0)	Hist 171 or 172 West. Civilization	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Literature Requirement*	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(3,0)	Phys 221 Thermal & Elec. Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			17	

JUNIOR YEAR

Hist 172 or 173 West. Civilization	3	(3,0)	Chemistry Major	4	
Chemistry Major	4		Minor	6	
Minor	3		Elective	6	
Elective	7			16	
	17				

SENIOR YEAR

Chemistry Major	4		Chemistry Major	4	
Minor	3		Minor	3	
Elective	8		Elective	8	
	15			15	

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† The organic chemistry will count toward the 24 hours of the chemistry major.

GEOLOGY

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

First Semester			*Second Semester*		
Geol 201 Physical Geology	4	(3,3)	Geol 202 Historical Geology	4	(3,3)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Modern Language	3	(3,0)
Modern Language	3	(3,0)	Approved Electives	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	15			15	

JUNIOR YEAR

Geol 306 Mineralogy	3	(2,3)	Geol 309 Petrology	3	(2,3)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Humanities	3		Humanities	3	
Major	3		Major	3	
Minor	3		Minor	3	
Approved Elective	3		Approved Elective	3	
	18			18	

SENIOR YEAR

Geol 402 Structural Geology	3	(2,2)	Geol 404 Economic Geology	3	(3,0)
Major	3		Major	3	
Minor	6		Minor	3	
Social Sciences	3		Social Sciences	3	
			Approved Elective	3	
	15			15	

128 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

MATHEMATICS

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester			*Second Semester*		
Engl 101 English Composition	3	(3,0)	Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
AS or MS or Elective‡	1		AS or MS or Elective‡	1	
	15			15	

SOPHOMORE YEAR

Literature Requirement*	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Literature Requirement*	3	(3,0)
Math 301 Stat. Th. & Methods I	3	(3,0)	Math 208 Engr. Math. I	4	(5,0)
Modern Language	3	(3,0)	Math 295 Foundations of Analysis†	3	(3,0)
Elective§	3		Elective§	3	
AS or MS or Elective‡	1		AS or MS or Elective‡	1	
	17			17	

JUNIOR YEAR

Econ 201 Principles of Econ.	3	(3,0)	Math Elective	3	
Math 411 Linear Algebra	3	(3,0)	Mus 210 Music Appreciation	3	(3,0)
			or AAH 303 Evol. of Visual Arts	3	(3,0)
Minor	3		Minor	3	
Natural Science	4		Natural Science	4	
Social Sciences	3		Social Sciences	3	
	16			16	

SENIOR YEAR

First Semester			*Second Semester*		
Math 412 Introd. to Mod. Alg.	3	(3,0)	Math 464 Math. Anal. II	3	(3,0)
or Math 419 App. Comb. Alg. I	3	(3,0)	or Math 454 Adv. Cal. II	3	(3,0)
Math 463 Math. Anal. I	3	(3,0)	Math Elective	3	
or Math 453 Adv. Cal. 1	3	(3,0)	Minor	3	
Minor	6		Humanities	3	
Elective§	4		Elective§	4	
	16			16	

128 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† The Foundations of Analysis will count toward the 24 hours of the Mathematics major.

‡ Those electing not to take ROTC should take four hours of electives during an appropriate semester.

§ Elective must be approved by adviser.

PHYSICS

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 112 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Phys 101 Current Topics in Mod. Physics	1	(0,2)	Phys 132 Gen. Phys. I	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 231 Gen. Phys. II	3	(3,0)	Phys 232 Gen. Phys. III	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Phys 321 Mechanics I	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Humanities	3		Phys 340 Elect. & Mag. I	3	(3,0)
Minor	3		Humanities	3	
Modern Language	3	(3,0)	Minor	3	
Electives	3		Modern Language	3	(3,0)
	15			15	

SENIOR YEAR

Phys 455 Quantum Phys. I	3	(3,0)	Physical Elective	4	
Physical Elective	4		Minor	3	
Minor	6		Social Science	3	
Social Science	3		Elective	6	
	16			16	

128 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

Note: For a major or minor concentration in Physics, Phys 221 and 222 will count.

MINOR CONCENTRATIONS

Biology. The recommended programs of study consists of 15 semester hours from the field of biological sciences in addition to Biol 101, Bot 102, 104, and Zool 102, 104.

Economics. The recommended program of study consists of Econ 201, 202, and 15 semester hours selected from the following (including 314 and 407): Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 404, 405, 406, Ag Ec 456, Mgt Sc 311.

English. The recommended program of study includes the required courses for the Bachelor of Arts curriculum and 15 semester hours of English, arranged as follows:

Group I—Six semester credits from these courses: Engl 405 and either 422 or 423.

Group II—Three semester credits from these courses: Engl 402, 404, 425, 427, 429, 431, 437, 443, 445, 446, 461, 462.

Group III—Six additional semester credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts consists of Hum 201-202 or Arch 101-102 and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected:

AAH 315, 316;
Arch 415, 416;
Engl 305, 308, 310, 311, 331, 332, 333;
Hum 203;
Mus 151, 152, 205, 206, 210, 251, 252, 305, 306, 311, 315, 316, 362, 365, 421, 422, 423;
Phil 305;
Visual Studies (all courses).

History. The recommended program of study consists of 15 semester hours with a minimum of three hours from each of the following groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300, including at least one course on the 400 level.

Philosophy. The recommended program of study consists of 15 semester hours of course work beyond Phil 201, 302—drawn from Phil 211, 303, 304, 305, 309, 312, 318, 322, 344, 422, 425.

Political Science. The recommended program of study consists of 15 semester hours beyond Pol Sc 101 (or 202 or 301) and 201 in courses drawn from at least three of the following fields:

1. American Government—Pol Sc 302, 403, 409
2. Public Administration—Pol Sc 321
3. Constitutional Law—Pol Sc 331, 432, 433
4. Political Behavior—Pol Sc 341, 433, 442
5. Political Thought—Pol Sc 351, 352
6. International Relations—Pol Sc 361, 462, 463, 464, 469, 473
7. Comparative Governments—Pol Sc 371, 372, 473

Psychology. The recommended program of study consists of required courses Psych 201, 202 and 15 semester hours to be selected from Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 498, Comp Sc 205.

Sociology. A minor consists of 15 semester hours beyond Soc 201, 202 to be selected from Pol Sc 341, Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499, RS 359.

CLUSTER MINORS

Group I—Social Sciences

No fewer than two courses in each subject chosen:

- Economics
- History
- Political Science
- Psychology
- Sociology

Group II—Philosophy and Religion

Group III—Fine Arts

Of these courses, 9 semester credits must be taken in courses numbered 300 or higher:

AAH 315, 316;
Arch 415, 416;
Engl 305, 308, 310, 311, 331, 332, 333;
Mus 151, 152, 205, 206, 210, 251, 252, 305, 306, 311, 315, 316, 362, 365, 421, 422, 423;

Phil 305;

Vis 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416.

Group IV—Administration

No fewer than two courses in each subject chosen:

- Economics
- Accounting
- Industrial Management

Group V—Life Sciences

No course in the 100 series is applicable and not more than two courses in the 200 series. No fewer than two courses in each subject chosen:

- Bacteriology
- Botany
- Genetics
- Zoology

Group VI—Physical Sciences

No course in the 100 series is applicable and not more than two courses in each subject chosen:

- Astronomy
- Chemistry
- Geology
- Mathematics
- Physics

BACHELOR OF SCIENCE CURRICULUMS

BOTANY

Botany is that portion of Biology dealing with plants, their structure, classification, growth, and development. The Botany major is designed to prepare students for employment as biologists in sales, service, or research in industry or government service. It also provides the background in the fundamental physical and biological sciences necessary for graduate study in the basic and many of the applied plant sciences. Adequate electives are provided so that a student may take additional courses in the area or areas of his special interest.

BOTANY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Ch 101 Gen. Chemistry	4	(3,3)	Bot 104 Lab. Exer. in Bot.	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 Gen. Chemistry	4	(3,3)
Math 103 College Algebra	2	(3,0)	Engl 102 English Composition	3	(3,0)
Math 104 Trigonometry	2	(3,0)	Math 106 Cal. of One Var.	4	(5,0)
AS or MS or Elective	1		Zool 102 Prin. of Zoology	2	(2,0)
			Zool 104 Lab. Exer. in Zool.	1	(0,2)
			AS or MS or Elective	1	
	15			18	

Sophomore Year

Econ 201 Principles of Econ.	3	(3,0)	Bot 202 Survey of Pl. Kingdom	4	(3,3)
Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Zool 201 Invertebrate Zoology	4	(3,3)	Social Science Elective	3	
or Zool 202 Vert. Zoology	4	(3,3)	Approved Electives	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	15			19	

Junior Year

Bot 352 Plant Physiology	4	(3,3)	Bot 356 Taxonomy of Vasc. Plants	3	(1,6)
Micro 305 Gen. Microbiology	4	(3,3)	Engl 301 Public Speaking	3	(3,0)
Chemistry Elective	4		Chemistry Elective	4	
Approved Elective	6		Approved Electives	6	
	18			16	

Senior Year

Bot 406 Plant Anatomy	3	(2,3)	Bot 459 Plant Ecology	3	(2,3)
Gen 302 Genetics	4	(3,3)	Social Science Elective	3	(3,0)
Social Science Elective	3	(3,0)	Approved Electives	10	
Approved Elective	7			16	
	17				

134 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

CHEMISTRY

Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to the student whose education is built around the principles of this discipline.

The curriculum in chemistry provides, through its advanced chemistry courses and large number of elective hours, a program that may be suited to a student's specific needs, whether he be interested in graduate work; industrial chemistry, sales or supervision; or related professional fields including medicine. Significant features of the program are the student's extensive participation in experimental laboratory work and his association with teachers who also pursue research activities. The undergraduate and graduate studies are closely connected, and an undergraduate may elect to take part in a research investigation during his junior and senior years.

CHEMISTRY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 172 or 173 West. Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective†	1 — 3		AS or MS or Elective†	1 — 3	
	15 — 17			15 — 17	

SOPHOMORE YEAR

Ch 223 Org. Chem.	3	(3,0)	Ch 224 Org. Chem.	3	(3,0)
Ch 225 Org. Chem. Lab.	2	(0,6)	Ch 226 Org. Chem. Lab.	2	(0,6)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	Phys 222 Optics & Mod. Phys.	3	(3,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
AS or MS (Elective)	1		AS or MS (Elective)	1	
	17 — 16			17 — 16	

JUNIOR YEAR

Ch 313 Quan. Analysis	3	(3,0)	Ch 332 Phys. Chemistry	3	(3,0)
Ch 315 Quan. Anal. Lab.	2	(0,6)	Ch 340 Phys. Chem. Lab.	1	(0,3)
Ch 331 Phys. Chemistry	3	(3,0)	Ch 411 Instr. Analysis	4	(2,6)
Ch 339 Phys. Chemistry Lab.	1	(0,3)	Ch 442 Chem. Lit.	1	(1,0)
Ger 101 Elem. German	4	(3,1)	Ger 102 Elem. German	4	(3,1)
Elective†	5		Elective†	4 — 2	
	18			17 — 15	

SENIOR YEAR

Ch 402 Inorg. Chem.	3	(3,0)	Ch 421 Adv. Org. Chemistry	3	(3,0)
Ch 435 Atom. & Mol. Struct.	3	(3,0)	Electives†	12	
Ch 436 Phys. Chem. Lab.	1	(0,3)			
Electives†	9			15	
	16				

130 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Electives:

For the degree of B.S. in Chemistry, a student must elect at least 18 hours in English, Languages, History, Political Science, Economics, Sociology, Psychology, etc. At least one advanced lecture course (400 level) in chemistry and one advanced laboratory must be elected.

GEOLOGY

Geology is a relatively young science. The word itself is only about 200 years old. It means the science of the earth. Such a science must be involved with the physics and chemistry of materials which comprise the earth, but equally important it must consider the development of life on earth. Fundamentally, then, the chemical, physical, and biological responses to various environments on and in the earth must be thoroughly understood so that the historical development of the earth may be deduced, predictions of the future inferred, and natural resources intelligently developed.

Industry in our modern civilization is dependent on minerals and rocks. Metals have their origin in them as do our chief power sources, coal, petroleum, and radioactive minerals. The power and wealth of nations depend largely on their exploration, control and development of mineral wealth.

Geologists today are entering upon a new era. Widening horizons are indicated by employment not only in mineral-producing industries but by railroads, municipalities, engineering firms, and water authorities. For this reason, it is important that the geologists' education rest on a broad yet rigorous base.

This curriculum provides the student with the fundamentals in the geological sciences and excellent support in the other basic sciences. On successful completion of the Bachelor of Science program the student should be adequately prepared for employment or for graduate study in any field of geology.

GEOLOGY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Modern Language[§]	4	(3,1)	Modern Language[§]	4	(3,1)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

SOPHOMORE YEAR

Geol 201 Physical Geology	4	(3,3)	Geol 202 Historical Geology	4	(3,3)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Modern Language	3	(3,0)
Modern Language	3	(3,0)	Phys 122 Mech. & Wave Phen.	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	18			17	

JUNIOR YEAR

Biol 101 Prin. of Biology	3	(3,0)	Bot 102 Prin. of Botany	2	(2,0)
Geol 306 Mineralogy	3	(2,3)	and Bot 104 Lab. Exer. in Bot.	1	(0,2)
Phys 221 Thermal & Elec. Phen.	3	(3,0)	or Zool 102 Prin. of Zoology	2	(2,0)
Phys 223 Electron Phys. Lab.	1	(0,3)	and Zool 104 Lab. Exer. in Zool.	1	(0,2)
Electives[†]	5		Ex St 301 Introd. Statistics	3	(2,2)
			Geol 309 Petrology	3	(2,3)
	15		Geol 313 Strat. and Sed.	3	(3,0)
			Phys 222 Optics & Mod. Phys.	3	(3,0)
			Phys 224 Modern Phys. Lab.	1	(0,3)
				16	

Summer Geology Field Camp[‡] 6

SENIOR YEAR

Geol 402 Structural Geology	3	(2,2)	Geol 310 Optical Mineralogy	3	(2,2)
Geol 403 Invert. Paleontology	3	(2,3)	Geol 404 Economic Geology	3	(3,0)
Approved Electives[†]	9		Approved Electives[†]	9	
	15			15	

134 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] At least 12 hours must be elected from the humanities and/or social sciences.

[‡] Clemson University does not conduct a field camp in geology, but attendance at a camp approved by the geology staff is required.

[§] German or French is recommended. Two years in the same language is required.

MATHEMATICS

The mathematics curriculum is designed to give basic training to those students whose ultimate goal is the creation of mathematical concepts and methods that are of basic and general applicability to the desired subject whether it be physics, computer science, communication theory, data processing, statistics, operations research, economics, or any branch of the physical sciences in which a strong mathematical background is a prerequisite. In addition to containing basic mathematics courses which are needed to prepare the student for the present day mathematical world, the curriculum allows the student in his junior year to select one of seven optional sets of courses which will provide an introduction to an area where mathematics is applied. These options are physics, operations research, computer science, managerial science, communications, chemistry, and statistics.

This curriculum provides an adequate background for the student who plans to pursue graduate study in mathematics and at the same time adequately prepares the student to fill many interesting positions in space research, computer development, business, or government research.

MATHEMATICS CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Hist 172 or 173 West. Civilization	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
AS or MS or Elective†	1		AS or MS or Elective†	1	
	15			15	

SOPHOMORE YEAR

Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Math 301 Stat. Th. & Methods I	3	(3,0)	Math 295 Foundations of Analysis	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(3,0)	Phys 221 Thermal & Elec. Phen.	3	(3,0)
Elective‡	3		Phys 223 Electron Phys. Lab.	1	(0,3)
AS or MS or Elective†	1		Elective‡	3	
			AS or MS or Elective†	1	
	17			18	

JUNIOR YEAR

Fr 101 Elem. French§	4	(3,1)	Econ 201 Principles of Econ.	3	(3,0)
or Ger 101 Elem. German§	4	(3,1)	Fr 102 Elem. French§	4	(3,1)
Math 411 Linear Algebra	3	(3,0)	or Ger 102 Elem. German§	4	(3,1)
Math 453 Adv. Calculus I	3	(3,0)	Math 402 Th. of Probability	3	(3,0)
or Math 463 Math. Anal. I	3	(3,0)	Math 454 Adv. Calculus II	3	(3,0)
Option	3		or Math 464 Math. Anal. II	3	(3,0)
Phys 222 Optics & Mod. Phys.	3	(3,0)	Option	3	
Phys 224 Modern Phys. Lab.	1	(0,3)			
	17			16	

SENIOR YEAR

First Semester		
Engl 301 Public Speaking	3	(3,0)
Math 403 Stat. Inference	3	(3,0)
or Math 404 Introd. to Stoch. Proc.	3	(3,0)
or Math 405 Stat. Th. & Methods II	3	(3,0)
Math 412 Introd. to Mod. Alg.	3	(3,0)
or Math 419 App. Comb. Alg.	3	(3,0)
Option	3	
Elective‡	3	
	15	

Second Semester	
Math Elective	3
Option	3
Electives‡	9
	15

128 Total Semester Hours

OPTIONS:

A. CHEMISTRY

Ch 331 Physical Chemistry	3	(3,0)
Ch 332 Physical Chemistry	3	(3,0)
Ch 339 Physical Chem. Lab.	1	(0,3)
Ch 340 Physical Chem. Lab.	1	(0,3)
Ch 402 Inorganic Chemistry	3	(3,0)
Ch 435 Atomic & Molec. Structure	3	(3,0)
Ch 436 Physical Chem. Lab.	1	(0,3)
	15	

B. COMMUNICATIONS

E&CE 320 Electronics I	2	(2,0)
E&CE 321 Electronics II	2	(2,0)
E&CE 325 Elec. & E'tromag. Lab.	1	(0,2)
E&CE 326 Elec. & E'tromag. Lab.	1	(0,2)
E&CE 330 Systems I	3	(3,0)
E&CE 331 Elec. Cir. Workshop I	3	(2,2)
E&CE 332 Systems II	2	(2,0)
E&CE 333 Elec. Cir. Workshop II	3	(2,2)
	17	

C. COMPUTER SCIENCE

Comp Sc 409 Introd. to Num. Anal. I	3	(3,0)
Comp Sc 410 Introd. to Num. Anal. II	3	(3,0)
Comp Sc 421 Introd. to Assembler Lang. Prog.	3	(3,0)
Comp Sc 428 Algo. Lang. & Comp.	3	(3,0)
Math 452 Linear Programming	3	(3,0)
	15	

D. MANAGERIAL SCIENCE

Econ 202 Principles of Econ.	3	(3,0)
Econ 314 Inter. Econ. Th.	3	(3,0)
Math 452 Linear Programming	3	(3,0)
Math 473 Introd. to Nonlin. Opt.	3	(3,0)
Mgt Sc 311 Introd. to Econometrics	3	(3,0)
or IM 404 Managerial Econ.	3	(3,0)
	15	

E. OPERATIONS RESEARCH

IM 402 Oper. Plan. & Control	3	(3,0)
Math 404 Introd. to Stoch. Proc.	3	(3,0)
Math 429 Num. Anal. I	3	(3,0)
Math 452 Linear Programming	3	(3,0)
Math 473 Introd. to Nonlin. Opt.	3	(3,0)
	15	

F. PHYSICS

Phys 321 Mechanics I	3	(3,0)
Phys 322 Mechanics II	3	(3,0)
or Astr 404 Astrodynamics	3	(3,0)
or Phys 441 Elec. & Magnetism	3	(3,0)
Phys 340 Elec. & Magnetism	3	(3,0)
	9	

G. STATISTICS

Math 404 Introd. to Stoch. Proc.	3	(3,0)
Math 405 Stat. Th. and Methods II	3	(3,0)
Math 409 Stat. Th. and Methods III	3	(3,0)
Math 471 Appl. Stat. Decision Theory	3	(3,0)
	12	

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] Those electing not to take ROTC should take four hours of electives during an appropriate semester.

[‡] Electives must be approved by adviser.

[§] Those qualifying for advanced placement should take languages during freshman year.

MATHEMATICS CURRICULUM WITH BIOLOGY OPTION

Freshman Year

First Semester			*Second Semester*		
Biol 101 Principles of Biology	3	(3,0)	Bot 102 Principles of Botany	2	(2,0)
Engl 101 English Composition	3	(3,0)	Bot 104 Lab. Exercise in Botany	1	(0,2)
Math 106 Cal. of One Variable	4	(5,0)	Comp Sc 205 Elem. Computer Programming	3	(3,0)
Phys 207 General Physics	4	(3,2)	Engl 102 English Composition	3	(3,0)
AS or MS or Elective†	1		Math 108 Calculus & Lin. Alg.	4	(5,0)
			Phys 208 General Physics	4	(3,2)
			AS or MS or Elective†	1	
	15			18	

Sophomore Year

Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Calculus of Sev. Var.	4	(5,0)	Math 208 Engineering Math. I	4	(5,0)
Math 301 Stat. Th. & Methods I	3	(3,0)	Math 295 Foundation of Analysis	3	(3,0)
Zool 102 Principles of Zoology	2	(2,0)	AS or MS or Elective†	1	
Zool 104 Lab. Exercise in Zoology	1	(0,2)		15	
AS or MS or Elective†	1				
	18				

Junior Year

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chemistry Lab.	1	(0,3)	Ch 228 Organic Chemistry Lab.	1	(0,3)
Fr 101 Elem. French§	4	(3,1)	Fr 102 Elem. French§	4	(3,1)
or Ger 102 Elem. German§	4	(3,1)	or Ger 102 Elem. German§	4	(3,1)
Math 411 Linear Algebra	3	(3,0)	Math 402 Theory of Probability	3	(3,0)
Math 453 Advanced Calculus I	3	(3,0)	Math 454 Advanced Calculus II	3	(3,0)
or Math 463 Math. Analysis I	3	(3,0)	or Math 464 Math. Analysis II	3	(3,0)
	14			14	

Senior Year

Hist 172 or 173 West. Civilization	3	(3,0)	Econ 201 Principles of Econ.	3	(3,0)
Math 403 Stat. Inference	3	(3,0)	Engl 301 Public Speaking	3	(3,0)
or Math 404 Introd. to Stoch. Proc.	3	(3,0)	Zool 302 Vertebrate Embryology	3	(2,3)
or Math 405 Stat. Th. & Methods II	3	(3,0)	or Bot 459 Plant Ecology	3	(2,3)
Math 412 Introd. to Mod. Alg.	3	(3,0)	Math Elective	3	(3,0)
or Math 419 Appl. Comb. Alg. I	3	(3,0)	Electives‡	5	
Zool 301 Comp. Vertebrate Anat.	3	(2,3)		17	
or Bot 202 Survey of Plant King.	4	(3,3)			
Elective‡	5 — 4				
	17				

128 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Those electing not to take ROTC should take four hours of electives during an appropriate semester.

‡ Electives must be approved by adviser.

§ Those qualifying for advanced placement should take languages during freshman year.

MEDICAL TECHNOLOGY

Medical Technologists are qualified to perform a wide variety of chemical, microscopical, and bacteriological tests to aid physicians in the detection, diagnosis, and treatment of disease. Some medical technologists are responsible to a medical doctor, generally a pathologist, while others work under the supervision of a medical scientist who specializes in a particular branch of clinical science. The largest group of medical technologists work in hospital laboratories.

In cooperation with the Anderson Memorial Hospital, the Greenville General Hospital, and Self Memorial Hospital in Greenwood, Clemson offers a four-year curriculum leading to the Bachelor of Science in Medical Technology. The student spends the first three years of this program in classwork at Clemson and the fourth year at one of the participating hospitals, according to the student's choice and previous agreement with the hospital. While in residence in Anderson, Greenville, or Greenwood, the student will take specified courses under instructors on the hospital staff. During the fourth year of work, both room and board are furnished by the hospital.

Upon satisfactory completion of the prescribed courses, the student will be awarded the Bachelor of Science degree in Medical Technology.

MEDICAL TECHNOLOGY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Biol 101 Prin. of Biology	3	(3,0)
Engl 101 English Composition	3	(3,0)	Ch 112 General Chemistry	4	(3,3)
Hist 101 American History	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 101 Mathematical Analysis I	3	(3,0)	Math 102 Mathematical Analysis II	3	(3,0)
Modern Language	4	(3,1)	Med Tech 101 Introd. to M. Tech.	1	(1,0)
AS or MS or Elective	1		Modern Language	4	(3,1)
			AS or MS or Elective	1	
	18			19	

SOPHOMORE YEAR

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chem. Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Hist 102 American History	3	(3,0)	Literature Requirement*	3	(3,0)
Literature Requirement*	3	(3,0)	Phys 207 Gen. Physics	4	(3,2)
Zool 102 Prin. of Zoology	2	(2,0)	Electives	3	
Zool 104 Lab. Exer. in Zoology	1	(0,2)	AS or MS or Elective	1	
AS or MS or Elective	1				
	17			18	

JUNIOR YEAR

Ch 313 Quan. Analysis	3	(3,0)	Gen 302 Genetics	4	(3,3)
Ch 317 Quan. Anal. Lab.	1	(0,3)	Hist 172 or 173 West. Civilization	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Micro 305 Gen. Microbiology	4	(3,3)
Phys 208 Gen. Physics	4	(3,2)	Psych 201 Gen. Psychology	3	(3,0)
Zool 307 An. Anat. & Physio.	3	(2,3)	Electives	3	
Electives	2				
	16			17	

SENIOR YEAR
(52 Weeks)

Med Tech 401	Serology and Immunology	4	(21,10, 49)[†]
Med Tech 402	Microbiology	7	(56, 6,470)
Med Tech 403	Hematology	5	(12,32,276)
Med Tech 404	Blood Bank	3	(8,20,132)
Med Tech 405	Cytology	1	(2,12, 26)
Med Tech 406	Histology	3	(20,30,190)
Med Tech 407	Urinalysis	2	(10, 8,102)
Med Tech 408	Chemistry	10	(40,50,470)
Med Tech 409	Radioisotopes	1	(2, 0, 7)
		36	
	141 Total Semester Hours		

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] First figure represents lecture hours, second figure represents seminar hours, and third figure represents clinical practice hours.

MICROBIOLOGY

Microbiology is the science which deals with the study of microscopic and submicroscopic forms of life, with emphasis on the bacteria and viruses. It also includes the study of yeasts, fungi, protozoa and unicellular algae. Microorganisms are of great importance to man for good or for ill. The microbiologist seeks to describe these minute life forms in terms of their structures, functions and processes of reproduction, growth and death, at both the cellular and molecular levels. He is also concerned with their interactions with the inanimate environment, with other living creatures, including the human, and their economic importance.

The microbiology major provides a thorough training in the basic microbiological skills. Furthermore, the student receives instruction in the areas of mathematics, physics, chemistry, and biochemistry, all of which are essential to the training of a modern-day microbiologist. At the same time, through a wide choice of electives, the program provides flexibility so that a student may prepare for any of several career choices after graduation. The microbiology graduate may enter graduate school in the fields of microbiology, biochemistry, bioengineering or related disciplines; he may enter a medical or dental school; or pursue a career in one of the many industries or public service departments dependent upon microbiology. Some of these are the fermentation and drug industries, medical and public health microbiology, various food industries, and agriculture.

MICROBIOLOGY CURRICULUM

FRESHMAN YEAR

First Semester		*Second Semester*	
Biol 101 Principles of Biology	3 (3,0)	Bot 102 Principles of Botany	2 (2,0)
Ch 101 General Chemistry	4 (3,3)	Bot 104 Lab. Exer. in Botany	1 (0,2)
Engl 101 English Composition	3 (3,0)	Ch 112 General Chemistry	4 (3,3)
Math 103 College Algebra	2 (3,0)	Engl 102 English Composition	3 (3,0)
Math 104 Trigonometry	2 (3,0)	Math 106 Calculus of One Var.	4 (5,0)
AS or MS or Elective	1	Zool 102 Principles of Zoology	2 (2,0)
		Zool 104 Lab. Exer. in Zoology	1 (0,2)
	15	AS or MS or Elective	1
			18

SOPHOMORE YEAR

Ch 223 Organic Chemistry	3 (3,0)	Bioch 301 Molecular Biology	3 (3,0)
Ch 227 Organic Chemistry Lab.	1 (0,3)	Ch 224 Organic Chemistry	3 (3,0)
Literature Requirement[*]	3 (3,0)	Ch 228 Organic Chemistry Lab.	1 (0,3)
Micro 305 General Microbiology	4 (3,3)	Literature Requirement[*]	3 (3,0)
Social Science Elective[§]	3	Microbiology Elective[‡]	3
Zoology Elective	3 — 4	Botany Elective	4 — 3
AS or MS or Elective	1	AS or MS or Elective	1
	18 — 19		18 — 17

JUNIOR YEAR

Engl 301 Public Speaking	3 (3,0)	Gen 302 Genetics	4 (3,3)
Micro 401 Adv. Bact.	4 (2,6)	Micro 412 Bact. Physiology	4 (3,3)
Physics Elective[†]	4 — 3	Physics Elective[†]	4
Approved Electives[‡]	7 — 6	Social Science Elective[§]	3
	17		15

SENIOR YEAR

Social Science Elective[§]	3 (3,0)	Micro 411 Pathogenic Bact.	3 (2,3)
Approved Electives[‡]	14	Approved Electives[‡]	13
	17		16

134 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

[†] To be selected from the following courses: First semester either Phys 207 or 122; and second semester either Phys 208, or 221, 223.

[‡] A minimum of 15 credits must be selected from the following courses: Bot 451, 457, Micro 402, 404, 410, 413, 414, 415, 416, 491, Pl Pa 456, PS 458, Zool 403, 456.

[§] To be selected from the following courses: Econ 201, 202, Hist 102, 171, 172, 173, Phil 201, 302, Pol Sc 101, 201, 301, 302, Psych 201, Rel 301, 302, RS 301, Soc 201.

Note: Credits for sophomore year should total 36.

PHYSICS

Physics is the fundamental science. The word physics comes from the Greek term meaning nature. Therefore, physics is a science dedicated to the study of all natural phenomena. Physics is the foundation for the other experimental sciences. The physics curriculum is designed with this point of view.

The first two years of the physics curriculum is generally the same as that for mathematics, the other physical sciences and engineering. During the junior and senior years the physics student is given a strong background in the basic physics courses at an advanced level and is allowed to specialize in a variety of other fields by selecting one of eight options. The options are astrophysics, biophysics, chemical physics, computer science, electronics, geophysics, mathematical physics, and physics. After completing one of these curriculums the student is prepared for positions in industry (*e. g.*, aircraft, electronics, petroleum, textiles, pharmaceutical) and government laboratories (*e. g.*, space research). Those students who select the physics or mathematical physics options are well equipped for graduate study in physics.

PHYSICS CURRICULUM WITH OPTIONS IN THE PHYSICAL AND MATHEMATICAL SCIENCES

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 112 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Hist 172 or 173 West. Civilization	3	(3,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Phys 132 Gen. Physics I	3	(3,0)
Phys 101 Current Topics in Mod. Physics	1	(0,2)	Approved Elective†	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

Fr 101 Elem. French¶	4	(3,1)	Fr 102 Elem. French¶	4	(3,1)
or Ger 101 Elem. German¶	4	(3,1)	or Ger 102 Elem. German¶	4	(3,1)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 223 Electron Phys. Lab. I	1	(0,3)	Phys 224 Modern Phys. Lab.	1	(0,3)
Phys 231 Gen. Physics II	3	(3,0)	Phys 232 Gen. Physics III	3	(3,0)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Math 309 Engr. Math. II‡	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Phys 321 Mechanics I	3	(3,0)	Phys 326 Exp. Physics II	4	(2,6)
Phys 325 Exp. Physics I	4	(2,6)	Phys 340 Elec. & Magnetism I	3	(3,0)
Approved Electives†	3		Option§	3	
Option§	3		Approved Elective†	3	
	16			16	

SENIOR YEAR

Phys 441 Elec. & Magnetism II	3	(3,0)	Physics (as approved)	3	(3,0)
Phys 455 Quantum Physics I	3	(3,0)	Approved Elective†	9	
Phys 465 Thermo. & Stat. Mech.	3	(3,0)	Option§	3	
Approved Elective†	3			15	
Option§	3				
	15				

128 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† A minimum of 12 hours of electives must be chosen from course offerings in the Humanities and Social Sciences.

‡ Math 411 may be taken in lieu of Math 309.

§ See OPTIONS, p. 222.

¶ Russ 101, 102 may be substituted.

OPTIONS:

A. ASTROPHYSICS

Astr 301 General Astronomy	3	(3,0)
Astr 302 General Astronomy	3	(3,0)
Astr 404 Astrodynamics	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
	12	

B. CHEMICAL PHYSICS

Ch 331 Physical Chem.	3	(3,0)
Ch 332 Physical Chem.	3	(3,0)
Ch 435 Atomic & Molec. Struct.	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
or Ch 402 Inorganic Chem.	3	(3,0)
	12	

C. COMPUTER SCIENCE

Comp Sc 205 Elem. Comp. Prog.	3	(3,0)
Comp Sc 409 Numerical Anal.	3	(3,0)
Comp Sc 421 Introd. to Assembler Lang. Prog.	3	(3,0)
Comp Sc 428 Algorith. Lang. & Compilers	3	(3,0)
or Phys 446 Solid St. Phys.	3	(3,0)
or Math 429 Numerical Anal. I	3	(3,0)
	12	

D. ELECTRONICS

E&CE 320 Electronics I	2	(2,0)
E&CE 325 Electronics Lab. I	1	(0,2)
E&CE 330 Systems I	3	(3,0)
E&CE 331 Elec. Cir. Workshop I	3	(2,2)
E&CE 332 Systems II	2	(2,0)
E&CE 333 Elec. Cir. Workshop II	3	(2,2)
	14	

E. GEOPHYSICS

	Geol 201 Physical Geology	4	(3,3)
	Geol 306 Mineralogy	3	(2,3)
Any two:	Geol 309 Petrology	3	(2,3)
	Geol 402 Struc. Geol.	3	(2,2)
	Phys 446 Solid St. Phys.	3	(3,0)
		13	

F. MATHEMATICAL PHYSICS

Math 453 Advanced Cal. I	3	(3,0)
Math 454 Advanced Cal. II	3	(3,0)
Phys 456 Quantum Physics II	3	(3,0)
Math (as approved)	3	(3,0)
	12	

G. PHYSICS

Phys 446	Solid St. Phys.	3	(3,0)
Phys 456	Quantum Physics II	3	(3,0)
Math	(as approved)	6	
		12	

PHYSICS CURRICULUM WITH BIOPHYSICS OPTION

The biophysics option is designed to provide a substantial background in physics as well as the biological and physical sciences. Thus, a student will be well prepared to pursue graduate study in biophysics or the biological and medical fields.

A total of 25 credit hours of approved biophysics electives is required, of which a minimum of 3 hours must be chosen in physics or mathematics, 6 hours from biological areas, and 12 hours, including 3 credit hours of laboratory, from the following chemistry and biochemistry courses: Ch 223, 224, 227, 228, 331, 332, 339, 340, Bioch 423, 424, 425, 426. Normally, Ch 223 and 227 will be scheduled for the first semester of the sophomore year.

FRESHMAN YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 102 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. & Lin. Alg.	4	(5,0)
Phys 101 Cur. Topics in Mod. Phys.	1	(0,2)	Phys 132 Gen. Physics I	3	(3,0)
Biology Elective	3		Biophysics Elective	3	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			18	

SOPHOMORE YEAR

First Semester			*Second Semester*		
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Math 206 Cal. of Sev. Var.	4	(5,0)	Math 208 Engr. Math. I	4	(5,0)
Phys 223 Electron Physics Lab.	1	(0,3)	Phys 224 Mod. Physics Lab.	1	(0,3)
Phys 231 Gen. Physics II	3	(3,0)	Phys 232 Gen. Physics III	3	(3,0)
Biophysics Elective	4		Biophysics Elective	4	
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Fr 101 Elem. French§	4	(3,1)	Fr 102 Elem. French§	4	(3,1)
or Ger 101 Elem. German§	4	(3,1)	or Ger 102 Elem. German§	4	(3,1)
Hist 171 or 172 West. Civilization	3	(3,0)	Phys 322 Mechanics II	3	(3,0)
Phys 321 Mechanics I	3	(3,0)	Phys 340 Elect. & Magnetism I	3	(3,0)
Phys 325 Exp. Physics I	4	(2,6)	Biophysics Elective	4	
Biophysics Elective	4		Approved Elective†	3	
	18			17	

SENIOR YEAR

Phys 455 Quantum Physics I	3	(3,0)	Physics (as approved)	3	(3,0)
Phys 465 Thermo. & Stat. Mech.‡	3	(3,0)	Biophysics Elective	3	
Biophysics Elective	3		Approved Elective†	8	
Approved Elective†	5				
	14			14	

129 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† A minimum of 12 hours of electives must be chosen from course offerings in the Humanities and Social Sciences.

‡ An approved Physics course may be substituted for Phys 465 if the student successfully completes Ch 331, 332.

§ Russ 101, 102 may be substituted.

PRE-MEDICINE AND PRE-DENTISTRY

Medicine and dentistry need individuals with a diversity of educational backgrounds and a wide variety of talents and interests. The philosophies of education, specific premedical and predental courses requirements, other qualifications for enrollment, and systems of training vary among the medical and dental schools, but all recognize the desirability of a broad education—a good foundation in the natural sciences (mathematics, chemistry, biology, and physics), highly developed communication skills, and a solid background in the social sciences and humanities. The absolute requirements for medical and dental school admission (16 credit hours in chemistry, 8 credit hours in biology, 8 credit hours in physics, 6 credit hours in English, and 6 credit hours in mathematics) are purposely limited in order to allow latitude for developing individualized undergraduate programs of study.

The student preparing for a career in medicine or dentistry can major in the behavioral or natural sciences, and many do major in one of the sciences; however, this is not necessary. The Association of American Medical Colleges and the American Association of Dental Schools recommend that the premedical and predental student should feel free to develop his major area of interest, realizing that the medical and dental school is more interested in the quality and scope of the work accomplished than in the time spent or the major field chosen. It is possible to major in a nonscience area, carrying the necessary science courses as electives; however, since so much of medicine and dentistry is derived from a scientific basis, the student who majors in a nonscientific field and elects the minimum number of required science courses must excel in them to insure the adequacy of his preparation.

A suggested curriculum in Pre-medicine and Pre-dentistry, offered here, is designed to meet the general entrance requirements of most medical and dental schools and, as well, to provide a broad education in the natural sciences, the social sciences, the humanities, and communication skills.

Those preparing for the study of medicine are advised to complete four years of undergraduate work before entering a medical school, although some medical schools will admit an exceptional student after three years of preparation. Many dental schools will accept the better student after three years of preparation.

PRE-MEDICINE AND PRE-DENTISTRY CURRICULUM

Freshman Year

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Ch 112 General Chemistry	4	(3,3)
Ch 101 General Chemistry	4	(3,3)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Math 108 Cal. & Lin. Alg.	4	(5,0)
Math 106 Cal. of One Var.	4	(5,0)	Zool 102 Prin. of Zoology	2	(2,0)
AS or MS or Elective	1		Zool 104 Lab. Exer. in Zoology	1	(0,2)
			AS or MS or Elective	1	
	15			15	

Sophomore Year

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Hum 201 Introd. to Humanities	3	(3,0)	Hum 202 Introd. to Humanities	3	(3,0)
Literature Requirement[*]	3	(3,0)	Literature Requirement[*]	3	(3,0)
Phys 122 Mech. & Wave Phen.	3	(3,0)	Phys 221 Therm. & Elec. Phen.	3	(3,0)
Soc 201 Introd. Sociology	3	(3,0)	Phys 223 Electron Phys. Lab.	1	(0,3)
AS or MS or Elective	1		Soc 202 Social Problems	3	(3,0)
			AS or MS or Elective	1	
	17			18	

Junior Year

Econ 201 Principles of Econ.	3	(3,0)	Econ 202 Principles of Econ.	3	(3,0)
Gen 302 Genetics	4	(3,3)	Engl 217 Vocabulary Bldg.	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Zool 301 Comp. Vert. Anat.	3	(2,3)	Zool 460 General Physiology	3	(2,3)
Electives	4		or Micro 305 Gen. Microbiology	4	(3,3)
			Electives	5	
	17			17 — 18	

Senior Year

Engl 301 Public Speaking	3	(3,0)	Soc 381 Society & Socialization	3	(3,0)
Psych 201 Gen. Psychology	3	(3,0)	or Psych 302 Social Psychology	3	(3,0)
Electives	10		Electives	12	
	16			15	

130 Total Semester Hours

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[*] To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

FIVE-YEAR INTEGRATED PROFESSIONAL CURRICULUM IN MEDICINE

Clemson University and the Medical University of South Carolina have established jointly a curriculum in Pre-medicine and Medicine which will permit a student who has successfully completed it to be graduated at the end of five years (60 months) with an M.D. degree from the Medical University and a B.S. degree from Clemson University.

Selection of students to participate in this program is the joint responsibility of Clemson University and the Medical University of South Carolina. Once a student is admitted to the program he continues in it as long as his record of academic achievement meets the minimum requirements as spelled out below.

The admissions process will begin at Clemson. Students who satisfactory meet Clemson's criteria for admission to the program (graduate in the upper 25 percent of his graduating class, and have a predicted grade-point ratio of 2.8 or better in his freshman year, as determined by Clemson University) will be so notified and at the same time will be informed that they must also meet the criteria established by the Medical University for admission to the program. Students will not be considered as having been accepted into this program until they have been notified in writing by both institutions, Clemson University and the Medical University, that they have satisfactorily met the admissions criteria of both institutions. The deadline for applications to the Clemson portion of the program is February 1, and neither nonresident nor transfer students are eligible.

The prescribed curriculum at Clemson University involves two years (24 months) of study. Successful completion of the curriculum at Clemson would include the student's having a cumulative grade-point ratio of at least 3.0, with not less than a grade-point ratio of 2.8 for any one semester. Upon the successful completion of the prescribed curriculum at Clemson University, the student will transfer to the College of Medicine of the Medical University of South Carolina for the completion of the requirements for an M.D. degree, this program to be completed within three years (36 months). Entering and remaining in the first two years (24 months) at Clemson of the proposed five-year program is purely voluntary. The student can withdraw and transfer to another curriculum at any time. He must withdraw if he fails to meet the grade-point ratio requirements.

Clemson University will offer a curriculum for the first two years (24 months) as outlined below. During the initial enrollment period at Clemson, however, a plan of study covering the entire period of enrollment at Clemson will be designed for each student. This plan of study will consider the student's individual capabilities and needs and the results of any advanced placement which he may achieve upon entering Clemson. The Medical University will offer to the students coming from Clemson in this program the opportunity to exempt by special examination certain of their required courses in the following areas: Biochemistry, Biometry, Cell Biology, Genetics, Microbiology, and Physiology.

In summary, the plan consists of a five-year integrated curriculum achieved through (1) the use of summers; (2) the possibility of advanced placement at both Clemson University and the Medical University of South Carolina; and (3) the option of basic science courses in the preprofessional curriculum. The key to this curriculum is flexibility.

CURRICULUM AT CLEMSON UNIVERSITY

1. Advanced placement examinations, with credit in Chemistry, Mathematics, Biology, History and English are offered at Clemson University prior to the student entering the preprofessional curriculum.

2. Core courses required of all those entering the curriculum:

	Hours Credit
Ch 101, 102, 223-227, 224-228	16
Biol 101, Zool 301, Micro 305	10
Engl 101, 102, 203, 204, 217	15
Math 106, 108	8
Phys 122, 221-223	7
Psych 201	3
Soc 201	3
Econ 201	3
Hist 171, 172(3)	6
Total	71

3. Twenty-one hours, at least nine of which must be concentrated in one of the following areas: at the 200, 300, or 400 level of courses, in addition to those specified in the Core: Chemistry, Economics, English, Fine Arts, Geology, Mathematics, Microbiology, Modern Languages, Philosophy, Physics, Political Science, Psychology, Sociology, Zoology.

4. Students in the curriculum are encouraged to strike a balance between the basic sciences and the humanities/social sciences. A total of 92 credits is required in addition to units earned through advanced placement examinations.

5. The following courses are recommended for those preparing for advanced placement examinations at the Medical University of South Carolina:

Bioch 423, 424; Gen 302, 451; Math 301, or Ex St 301; Micro 411, 412, 414, 415, 416; Zool 458.

FIVE-YEAR INTEGRATED PROFESSIONAL CURRICULUM IN MEDICINE

FIRST YEAR

First Semester			*Second Semester*		
Ch 101 General Chemistry	4	(3,3)	Ch 112 General Chemistry	4	(3,3)
Engl 101 English Composition	3	(3,0)	Engl 102 English Composition	3	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Math 108 Cal. and Lin. Alg.	4	(5,0)
Psych 201 Gen. Psychology	3	(3,0)	Soc 201 Introd. Sociology	3	(3,0)
Zool 102 Prin. of Zoology	2	(2,0)	Zool 301 Comp. Vert. Anat.	3	(2,3)
Zool 104 Lab. Exer. in Zoology	1	(0,2)			
	17			17	

Summer

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chemistry Lab.	1	(0,3)	Ch 228 Organic Chemistry Lab.	1	(0,3)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
	7			7	

SECOND YEAR

Econ 201 Prin. of Economics	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Engl 217 Vocabulary Building	3	(3,0)	Phys 221 Therm. & Elec. Phen.	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Phys 223 Electron Phys. Lab.	1	(0,3)
Micro 305 Gen. Microbiology	4	(3,3)	Concentration	6	
Phys 122 Mech. & Wave Phen.	3	(3,0)	Electives	6	
Elective	3				
	19			19	

Summer

Concentration	3
Elective	3
	6

Optional: (A period in which the student may rest, work, make up deficiencies, or take additional courses.)

92 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

PRE-PHARMACY

Pharmacy is a five-year program, the first two years of which can be taken at Clemson. The student who does Pre-pharmacy here will transfer, as a rule, to the School of Pharmacy of the Medical University of South Carolina, where the final three years will be completed and by which institution the degree in Pharmacy will be awarded.

PRE-PHARMACY CURRICULUM

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Prin. of Biology	3	(3,0)	Ch 112 General Chemistry	4	(3,3)
Ch 101 General Chemistry	4	(3,3)	Engl 102 English Composition	3	(3,0)
Engl 101 English Composition	3	(3,0)	Hist 172 or 173 West. Civilization	3	(3,0)
Hist 171 or 172 West. Civilization	3	(3,0)	Math 102 Math. Analysis II	3	(3,0)
Math 101 Math. Analysis I	3	(3,0)	Zool 102 Prin. of Zoology	2	(2,0)
AS or MS or Elective	1		Zool 104 Lab. Exer. in Zoology	1	(0,2)
			AS or MS or Elective	1	
	17			17	

SOPHOMORE YEAR

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Org. Chemistry Lab.	1	(0,3)	Ch 228 Org. Chemistry Lab.	1	(0,3)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Phys 207 Gen. Physics	4	(3,2)	Phys 208 Gen. Physics	4	(3,2)
Soc 201 Introd. Sociology	3	(3,0)	Soc 202 Social Problems	3	(3,0)
AS or MS or Elective	2		Electives	3	
			AS or MS or Elective	1	
	16			18	

68 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

ZOOLOGY

Zoology is the descriptive and experimental science that investigates all aspects of animal life. Zoology ranges from comprehensive studies by ecologists to intensive studies of the ultra-small by electron microscopists. Knowledge of zoology is necessary to understand the past, control the present, and shape the future.

Zoology majors receive broad classroom, laboratory, and field training in classical and modern zoology, along with the latter's emphasis on physics, chemistry, and mathematics.

Zoology majors planning to enter eventually either: (1) graduate school in Zoology, (2) professional careers in the Health Sciences, (3) graduate school in Bioengineering, or (4) graduate school in Biophysics, Biochemistry, or Biomathematics are advised to select the appropriate specialized option listed in the Zoology curriculum. Zoology majors not planning to enter either the health professions or graduate school in Zoology are advised to select the General Option, whose flexibility permits selection of electives useful in business, government, and other occupations.

ZOOLOGY CURRICULUM WITH OPTIONS

FRESHMAN YEAR

First Semester			*Second Semester*		
Biol 101 Principles of Biology	3	(3,0)	Bot 102 Principles of Botany§	2	(2,0)
Ch 101 General Chemistry	4	(3,3)	Bot 104 Lab. Exercise in Botany§	1	(0,2)
Engl 101 English Composition	3	(3,0)	Ch 102 General Chemistry	4	(3,0)
Math 106 Cal. of One Var.	4	(5,0)	Engl 102 English Composition	3	(3,0)
AS or MS or Elective	1		Elective†	6	
			AS or MS or Elective	1	
	15			17	

SOPHOMORE YEAR

Ch 223 Organic Chemistry	3	(3,0)	Ch 224 Organic Chemistry	3	(3,0)
Ch 227 Organic Chemistry Lab.	1	(0,3)	Ch 228 Organic Chemistry Lab.	1	(0,3)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Phys 207 General Physics‡	4	(3,2)	Phys 208 General Physics‡	4	(3,2)
Zool 201 Invertebrate Zoology	4	(3,3)	Zool 202 Vertebrate Zoology	4	(3,3)
or Zool 202 Vertebrate Zool.	4	(3,3)	or Zool 201 Invertebrate Zool.	4	(3,3)
AS or MS or Elective	1		AS or MS or Elective	1	
	16			16	

JUNIOR YEAR

Engl 301 Public Speaking	3	(3,0)	Bioch 301 Molecular Biology	3	(3,0)
Gen 302 Genetics	4	(3,3)	Option and Electives	13	
Zool 302 Vertebrate Embryology	3	(2,3)		16	
Botany Elective	3				
Elective	3				
	16				

SENIOR YEAR

Zool 411 Animal Ecology	3	(2,3)	Option and Electives	16	
Zool 460 General Physiology	3	(2,3)		16	
Option and Electives	12				
	18				

130 Total Semester Hours

OPTIONS:

A. PRE-GRADUATE SCHOOL

BioE 401 Computers for Bioscientists	1	(1,0)
Ex St 301 Introductory Statistics	3	(2,2)
Zool 310 Evolution	2	(2,0)
Zool 470 Animal Ethology	3	(2,3)
Zool 491 Special Problems in Zoology	2	(0,6)
	11	

B. PRE-HEALTH PROFESSIONS

BioE 401 Comp. for Bioscientists	1	(1,0)
Econ 201 Principles of Economics	3	(3,0)
Ex St 301 Introductory Statistics	3	(2,2)
Micro 305 General Microbiology	4	(3,3)
Zool 301 Comparative Vertebrate Anatomy	3	(2,3)
Zool 310 Evolution	2	(2,0)
Zool 458 Cell Physiology	3	(2,3)
Zool 470 Animal Ethology	3	(2,3)
	22	

C. PRE-BIOMEDICAL ENGINEERING

BioE 301 Engr. Aspects Biol. Med.	2	(2,0)
Comp Sc 205 Elem. Computer Programming	3	(3,0)
Math 108 Cal. and Lin. Algebra	4	(5,0)
Math 206 Cal. of Sev. Variables	4	(5,0)
Phys 224 Modern Physics Lab.	1	(0,3)
Phys 232 General Physics for Physics Majors III	3	(3,0)
	17	

D. PRE-BIOCHEMISTRY, -BIOMATHEMATICS, -BIOPHYSICS

Comp Sc 205 Elem. Computer Programming	3	(3,0)
Math 108 Cal. and Lin. Algebra	4	(5,0)
Math 206 Cal of Sev. Variables	4	(5,0)
Phys 224 Modern Physics Lab.	1	(0,3)
Phys 232 General Physics for Physics Majors III	3	(3,0)
	15	

E. GENERAL PROGRAM

Zoology Electives	21
	21

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† A minimum of 9 elective hours must be chosen from course offerings in the Humanities and Social Sciences. A minimum of 21 elective hours must be selected from course offerings of the Department of Zoology.

‡ Phys 132, 223, and 231 replace Phys 207 and 208 for students taking options C or D.

§ Bot 202 may be taken in lieu of Bot 102 and 104.

DESCRIPTION OF COURSES

This list of courses includes for each course the catalog number, title of course, credit in semester hours, class laboratory hours per week, and the description of the course. In general, courses numbered 100-199 are freshman courses; 200-299, sophomore courses; 300-399, junior courses; and 400-499, senior courses. Courses numbered 600 or above are graduate courses and are open only to students admitted to the Graduate School, except that seniors with exceptional records may be enrolled with special permission. Where courses are offered on a schedule, there is a designation F, S, or SS following the title of each course, indicating whether it is customarily offered in the fall, spring, or summer school.

ACCOUNTING

Professor: C. C. Davis

Associate Professors: F. R. Gray, J. M. Wannamaker

Assistant Professors: R. W. Barron, J. A. Turner

Instructors: B. B. Johnson, C. Skinner

Acct 201—Principles of Accounting—3 cr. (3 and 0)

Practice in handling real and nominal accounts, together with an introduction to the use of various types of books of original entry, statements of profit and loss, and balance sheets.

Acct 202—Principles of Accounting—3 cr. (3 and 0)

Continuation of Acct 201 with special attention to corporation and partnership accounting with emphasis on adjustment procedures and the analysis of financial statements. *Prerequisite:* Acct 201.

Acct 301—Intermediate Accounting—3 cr. (3 and 0)

A course in the theory of accountancy designed to follow introductory theory presented in the basic principles courses. Intermediate accounting seeks to broaden the student's knowledge of financial accounting theory and practice. *Prerequisite:* Acct 201, 202.

Acct 302—Intermediate Accounting—3 cr. (3 and 0)

A continuation of Accounting 301 with emphasis on managerial accounting. *Prerequisite:* Acct 201, 202.

Acct 303—Cost Accounting—3 cr. (3 and 0)

The application of cost analysis to manufacturing and distributing problems. Analysis of the behavior characteristics of business costs and a study of principles involved in standard cost systems. Lectures and problems. *Prerequisite:* Acct 201, 202.

Acct 305—Income Taxation—3 cr. (3 and 0)

Interpretation of Federal Income Tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Prerequisite:* Junior standing.

Acct 403—Accounting Research—2 cr. (2 and 0)
A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

Acct 405—Advanced Federal Taxes—3 cr. (3 and 0)
Tax planning and research. Advanced phases of income taxation with emphasis on special problems applicable to corporations, partnerships, estates and trusts. *Prerequisite:* Acct 305.

Acct 407—Accounting Research—1 cr. (1 and 0)
A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

Acct 410—Budgeting and Executive Control—3 cr. (3 and 0)
The study and application of selected techniques used in the planning and control functions of business organizations. *Prerequisite:* Acct 303.

Acct 411—Advanced Accounting—3 cr. (3 and 0)
A study of accounting principles and practices emphasizing parent-subsidiary accounting. *Prerequisite:* Acct 301, 302.

Acct 415—Auditing—3 cr. (3 and 0)
Professional and practical auditing theory. Review of internal controls, audit procedures, and development of audit programs for various types of businesses; consideration of auditor's professional and ethical standards. *Prerequisite:* Acct 301, 302.

Acct 420—CPA Review—3 cr. (3 and 0)
Intensive practice in analyzing and solving CPA level accounting problems. *Prerequisite:* Acct 411.

Acct 605—Advanced Federal Taxes—3 cr. (3 and 0)

Acct 610—Budgeting and Executive Control—3 cr. (3 and 0)

Acct 611—Advanced Accounting—3 cr. (3 and 0)

Acct 615—Auditing—3 cr. (3 and 0)

AEROSPACE STUDIES

Professor: Col. E. N. Tyndall, *Head*

Assistant Professors: Maj. A. C. Brock, Maj. R. C. Grant, Maj. M. R. Koldyke, Jr., Capt. H. R. Hubbard, Capt. R. M. Peavler

GENERAL MILITARY EDUCATION PROGRAM

AS 109—World Military Systems—1 cr. (1 and 1)
An introduction to factors of national power, principles and nature of war; legislation, organization and function of the Department of Defense; history, missions, and organization of the United States Air Force. Corps Training includes drill fundamentals, customs and courtesies of the service.

AS 110—World Military Systems—1 cr. (1 and 1)
Surveys the history and development of U.S. strategic offensive and defensive forces including their missions, functions and organization; conventional nuclear weaponry, civil defense, aircraft and missile defense, concepts of

present and projections of future strategic defense requirements. Corps Training includes drill and ceremonies and Air Force career opportunities.

AS 209—World Military Systems—1 cr. (1 and 1)

A continuation of the study of world military forces placing special emphasis on the General Purposes forces of the Air Force, Army and Navy and their role throughout the entire spectrum of warfare. Also included are the roles of the aerospace support forces which enable the combat forces to carry out their primary missions. Corps Training.

AS 210—World Military Systems—1 cr. (1 and 1)

A study of the trends and implications in international affairs highlighting the struggle, the search and the prospects for peace. Special emphasis is given the conflict between democracy and communism, the alliances and collective security agreements of the United States to preserve peace and some of the specific problems and solutions involved in the search for peace. Corps Training.

PROFESSIONAL OFFICER EDUCATION PROGRAM

AS 309—Growth and Development of Aerospace Power—3 cr. (3 and 1)

A comprehensive study of the development of Aerospace Power and the USAF, its doctrine, mission and organization. Course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training emphasizes leadership development and Air Force career opportunities.

AS 310—Growth and Development of Aerospace Power—3 cr. (3 and 1)

A study of current and planned space programs. Reviews the characteristics of the solar system and operating principles associated with the major components of space exploration systems. As in AS 309, course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training includes drill and ceremonies and the environment of the Air Force officer.

AS 409—Concepts of Air Force Leadership—3 cr. (3 and 1)

A study of military professionalism, leadership, and discipline. Covers leadership theory and practice. Compares leadership in the military with private enterprise. Flight instruction and ground school for pilot candidates. Corps Training provides cadets experience in the guidance, direction, and control of an Air Force unit.

AS 410—Concepts of Air Force Management—3 cr. (3 and 1)

A continuation of the study of professionalism with the stress on management principles and functions. An introduction to systems and approaches to decision making and resource control used in the Air Force. Includes participation in problem-situation exercises. The course concludes with instruction to prepare cadets for active duty in the Air Force. Corps Training emphasizes advanced leadership functions.

AGRICULTURAL ECONOMICS

Professors: L. M. Bauknight, Jr., A. B. Carroll, W. J. Lanham, *Head;* J. M. Stepp

Associate Professors: B. L. Dillman, J. C. Hite, J. W. Hubbard, J. S. Lytle, H. C. Spurlock, G. R. von Tungeln

Assistant Professor: R. K. DeHaven

Ag Ec 202—Agricultural Economics—3 cr. (3 and 0) F, S

An analytical survey of the various subdivisions of agricultural economics, to include farm organization, enterprise analysis, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy. *Prerequisite:* Econ 201.

Ag Ec 302—Agricultural Firm Management—3 cr. (2 and 3) F, S

Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is directed to management aspects of the farm as a production unit. *Prerequisite:* Ag Ec 202 or Econ 202.

Ag Ec 305—Agricultural Business Analysis—3 cr. (2 and 3) F, S

The principles of financial statement analysis applied to management of farms and other agricultural business firms. Emphasis is placed on enterprise analysis, profitability determination, and other aspects of internal financial operations. *Prerequisite:* Ag Ec 202 or Econ 202.

Ag Ec 309—Economics of Agricultural Marketing—3 cr. (3 and 0) F, S

A general course in marketing agricultural commodities, with particular emphasis upon food products. Efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions are analyzed. *Prerequisite:* Econ 201.

Ag Ec 351—Advertising and Merchandising—3 cr. (3 and 0) F, S

A general introduction to advertising and merchandising theories and some practice with basic techniques. A partial list of subjects covered includes: function of advertising, propriety in advertising, institutions, media, market research, consumer appeals, loss leaders, mass displays, trademarks and brands, writing copy, color, layout, agencies and integrated advertising campaigns. *Prerequisite:* Junior standing.

Ag Ec 352—Public Finance—3 cr. (3 and 0) F, S, SS

Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy.

Ag Ec 357—Natural Resource Economics—3 cr. (3 and 0) F, S, SS

The principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. *Prerequisite:* Econ 201.

Ag Ec 402—Economics of Agricultural Production—3 cr. (3 and 0) F

An economic analysis of agricultural production involving (a) the concept of the farm as a firm, (b) principles for decision making, (c) the quantitative nature and use of production and cost functions and their interrelations and

application of these principles to resource allocation on farms and among areas. *Prerequisite:* Permission of instructor.

Ag Ec 403—Land Economics—3 cr. (3 and 0)
A study of the characteristics of land and of the physical, legal, social and economic principles and problems relating to the control and use of land resources. *Prerequisite:* Permission of instructor.

Ag Ec 405—Seminar—1 cr. (1 and 0) F
An examination of the relation of economics and sociology to specific problems. *Prerequisite:* Major in Agricultural Economics.

Ag Ec 406—Seminar—1 cr. (1 and 0) S
A continuation of Ag Ec 405.

Ag Ec 451—Agricultural Cooperation—2 cr. (2 and 0) F
The principles and practices of business organization and management governing the successful operation of cooperative business enterprises. Major emphasis is placed upon cooperative selling, processing, purchasing, and service enterprises that serve farm people. *Prerequisite:* Econ 201.

Ag Ec 452—Agricultural Policy—3 cr. (3 and 0) F, S
A review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Included are economic considerations as related to past and current farm price and income problems. *Prerequisite:* Ag Ec 202 or Econ 202.

Ag Ec 456—Prices—3 cr. (3 and 0) F, S
A review of the basic theory of price under competitive conditions and various modifications; nature, measurement and causes of daily, seasonal and cyclical price fluctuations; geographical price relationships; nature, function and behavior of futures markets; government price programs. *Prerequisite:* Ag Ec 202 or Econ 202.

Ag Ec 460—Agricultural Finance—2 cr. (2 and 0) F, S
The financial needs of agriculture and of the organization, functions and interrelationships of agencies developed to meet these needs. *Prerequisite:* Econ 201.

Ag Ec 602—Economics of Agricultural Production—3 cr. (3 and 0)

Ag Ec 603—Land Economics—3 cr. (3 and 0)

Ag Ec 651—Agricultural Cooperation—2 cr. (2 and 0)

Ag Ec 652—Agricultural Policy—3 cr. (3 and 0)

Ag Ec 656—Prices—3 cr. (3 and 0)

Ag Ec 660—Agricultural Finance—2 cr. (2 and 0)
Ag Ec 701—Agribusiness Management Principles—3 cr. (3 and 0)

Ag Ec 802—Agricultural Production Economics Problems—3 cr. (3 and 0)

Ag Ec 804—Water Resource Policies—3 cr. (3 and 0)

Ag Ec 805—Seminar in Marine Resources Management and Policy—3 cr. (3 and 0)

Ag Ec 806—Economic Development in Agricultural Areas—3 cr. (3 and 0)

Ag Ec 807—Market Structure in Agricultural Industries—3 cr. (3 and 0)

Ag Ec 808—Applied Quantifications in Agricultural Economics—3 cr. (3 and 0)

Ag Ec 814—Contemporary Economic Problems—3 cr. (3 and 0)

Ag Ec 851—Seminar in Research Methodology—1 cr. (1 and 0)

Ag Ec 891—Thesis Research—Credit to be arranged.

Ag Ec 904—Seminar in Resource Economics—3 cr. (3 and 0)

Ag Ec 906—Seminar in Area Economic Development—3 cr. (3 and 0)

Ag Ec 907—Agricultural Marketing Problems—3 cr. (3 and 0)

Ag Ec 991—Doctoral Research—Credit to be arranged.

AGRICULTURAL EDUCATION*

Professors: E. T. Carpenter, *Head;* J. H. Rodgers

Associate Professors: W. C. Bowen, J. A. Hash

Ag Ed 201—Introduction to Agricultural Education—3 cr. (2 and 2)
Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of agricultural courses.

Ag Ed 401—Methods in Agricultural Education—3 cr. (2 and 2)
Appropriate methods of teaching vocational agriculture in high schools. The course includes procedures for organizing teaching programs, teaching high school students, and directing F.F.A. activities.

Ag Ed 406—Directed Teaching—6 cr. (0 and 18)
Guided participation in the professional responsibilities of a teacher of vocational agriculture including an intensive study of the problems encountered and the competencies developed. A half semester of directed teaching in selected schools is required. *Prerequisite:* Ag Ed 401, 422.

Ag Ed 422—Introduction to Adult Education—3 cr. (2 and 2)
History and nature of adult education in the United States, with emphasis on adult education for rural people.

Ag Ed 431—Methods in Conservation Education—3 cr. (3 and 0)
A study of various techniques appropriate to teaching conservation. Instruction is applicable to both elementary and high school teachers. (Offered in Summer School only.)

Ag Ed 463—Advanced Conservation Education—3 cr. (3 and 0)
The broader aspects of conservation education. The course includes historical, geographical, and national conservation problems. (Offered in Summer School only.)

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* Jointly administered by the College of Education and the College of Agricultural Sciences.

Ag Ed 465—Program Development in Agricultural Education—3 cr. (3 and 0)

Each student will determine needs and resources in a specific community and plan a program to meet these needs.

Ag Ed 467—Adult Education in Agriculture—3 cr. (2 and 3)

Principles and practices appropriate to the solution of problems encountered in instructional programs for adult farmers.

Ag Ed 601—Methods in Agricultural Education—3 cr. (2 and 3)

Ag Ed 663—Advanced Conservation Education—3 cr. (3 and 0)

Ag Ed 665—Program Development in Agricultural Education—3 cr. (3 and 0)

Ag Ed 667—Adult Education in Agriculture—3 cr. (2 and 3)

Ag Ed 803—Evaluation in Agricultural Education—3 cr. (2 and 3)

Ag Ed 804—Special Problems—3 cr. (2 and 3)

Ag Ed 805—Administration and Supervision in Agricultural Education—3 cr. (3 and 0)

Ag Ed 815—Advanced Methods of Teaching Farm Mechanics—3 cr. (2 and 3)

Ag Ed 820—Teaching Young Farmers—3 cr. (3 and 0)

Ag Ed 825—Supervision of Student Teaching—3 cr. (3 and 0)

Ag Ed 869—Seminar—1-3 cr. (1-3 and 0)

Ag Ed 891—Introduction to Research in Education—3 cr.

AGRICULTURAL ENGINEERING*

Professors: T. H. Garner, J. T. Ligon, A.W. Snell, *Head;* T. V. Wilson

Associate Professors: J. G. Alphin, C. L. Barth, J. T. Craig, C. E. Hood, Jr., J. R. Lambert, E. B. Rogers, Jr., B. K. Webb

AgE 205—Farm Shop—3 cr. (2 and 3) S

Correct methods and underlying reasons in proper use and maintenance of hand and power tools are emphasized. Principal topics include: carpentry, painting and finishing, soldering and sheet metal work, farm concrete, pipe fitting and plumbing, and farm and home water supply systems.

AgE 206—Agricultural Mechanization—3 cr. (2 and 3) F, S

The agricultural student is taught to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Planning efficient operational systems and wise selection of equipment, based on function and economic suitability, are stressed. *Prerequisite:* Math 103, 104, Phys 207.

AgE 212—Fundamentals of Mechanization—3 cr. (2 and 3) S

Functional analysis of selected agricultural equipment and the economic performance of machine systems; also, the utility and principles of applied technology and processes essential to providing a background for engineering design, research and development. *Prerequisite:* EG 109.

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* Jointly administered by the College of Agricultural Sciences and the College of Engineering.

AgE 221—Soil and Water Resources Engineering I—3 cr. (2 and 3) F
Physical relationships of factors governing rainfall disposition are used as bases for defining the hydrology of agricultural watersheds. The surveying necessary for design and application of resource management measures and structures is taught. *Prerequisite:* Math 106.

AgE 301—Soil and Water Conservation—3 cr. (2 and 3) F
Engineering and agronomic principles are applied to water management in agriculture. Elementary surveying, mathematics, crops and soil fundamentals are embodied into principles and practices of erosion control, drainage, water conservation and irrigation. *Prerequisite:* Math 103, 104.

AgE 352—Farm Power—3 cr. (2 and 3) F, SS, '73 and alternate years.
Farm tractors and stationary power units. Principles of operation, preventive maintenance, adjustment and general repair are emphasized. *Prerequisite:* AgE 206.

AgE 353—Computational Systems—2 cr. (1 and 3)
This course involves the advanced utilization of digital computation for the solution of agricultural engineering problems including simulation of biological systems. Basic operating principles and applications of analog computation will be stressed. *Prerequisite:* Engr 180, Math 208.

AgE 355—Engineering Analysis and Creativity—2 cr. (1 and 3) F
The creative and analytical portions of the engineering design process are developed in a problem approach. Application of physical and mathematical principles, analytical and experimental modeling and intelligent assumption making are stressed. Students are also introduced to the techniques of systems analysis. *Prerequisite:* Math 208, Phys 221.

AgE 360—Farm and Home Utilities—3 cr. (2 and 3)
S, SS, '72 and alternate years.
A course for seniors and graduate students in agriculture curriculums, involving a study of electric and other utilities on the farm and in the home. Selection installation and maintenance of wiring systems, motors and controls, home water systems and sewage disposal systems are emphasized. *Prerequisite:* Junior standing.

AgE 362—Energy Conversion in Agricultural Systems—3 cr. (2 and 3)
S, '73 and alternate years.
The energy requirements of agricultural systems with emphasis upon energy conversion methods. Characteristics of various sources of energy will be considered including economic aspects. The present energy conversion mechanisms used in agriculture will be studied and their limitations considered. *Prerequisite:* ME 311.

AgE 416—Agricultural Machinery Design—3 cr. (2 and 3) S
Engineering analysis of machines and basic agricultural operations and systems requiring machine functions. Fundamentals of machine design with applications to agricultural machinery. Velocity and acceleration, analyses, dimension determination, power transmission, and vibrations in machinery are studied. *Prerequisite:* EM 304.

AgE 422—Soil and Water Resources Engineering II—3 cr. (2 and 3) S
Basic soil-water-plant relationships are used to establish criteria for the analysis and design of facilities and structures for conservation, water control, drainage and irrigation. Engineering relationships involved in the design of such facilities are emphasized. *Prerequisite:* Math 208, EM 320.

AgE 431—Agricultural Structures Design—3 cr. (2 and 3)
F, '73 and alternate years.
Analytic and synthetic design of building components, including fastening devices, as determined by both live and dead loads with emphasis on statically determinant members and their positions and utilization in frames and trusses. Major materials considered are wood, steel, and concrete. *Corequisite:* EM 304.

AgE 442—Agricultural Process Engineering—3 cr. (2 and 3)
S, '74 and alternate years.
Design of unit operations components used in agricultural processing. Engineering principles and instrumentation as applied to control systems, heat transfer, materials handling, storage and related subjects are emphasized. *Prerequisite:* ME 311, E&CE 308.

AgE 465—Engineering Properties of Biological Materials—3 cr. (2 and 3) S, '73 and alternate years.
The thermal, electrical, mechanical, and chemical characteristics of biological materials, organisms, and metabolic processes are studied in relationship to engineering analysis and synthesis. The effects of environmental factors imposed by engineering processes are evaluated. *Prerequisite:* Math 208, EM 304, Biol 101.

AgE 471—Undergraduate Research—1 cr. (0 and 3) F
A course to acquaint senior students in Agricultural Engineering with the scientific method. Literature investigations, planning and executing of an experiment are integral parts of the course. *Prerequisite:* Senior standing in Agricultural Engineering.

AgE 473—Special Topics in Agricultural Engineering—3 cr. (3 and 0)
A comprehensive study of special topics in the field of agricultural engineering not covered in other courses. Special emphasis will be placed on independent pursuit of detailed investigations.

AgE H473—Special Topics in Agricultural Engineering—3 cr. (3 and 0)
Honors section of AgE 473; admission by invitation.

AgE 616—Agricultural Machinery Design—3 cr. (2 and 3)

AgE 622—Soil and Water Resources Engineering II—3 cr. (2 and 3)

AgE 631—Agricultural Structural Design—3 cr. (2 and 3)

AgE 642—Agricultural Process Engineering—3 cr. (2 and 3)

AgE 652—Farm Power—3 cr. (2 and 3)

AgE 660—Farm and Home Utilities—3 cr. (2 and 3)

AgE 665—Engineering Properties of Biological Materials—3 cr. (2 and 3)

AgE 801—Special Problems in Agricultural Engineering—3 cr. (3 and 0)

AgE 806—Instrumentation in Agricultural and Biological Research—3 cr. (2 and 3)

AgE 811—Tillage and Soil Dynamics—3 cr. (3 and 0)

AgE 822—Water Movement in Soils—3 cr. (3 and 0)

AgE 865—Heat and Moisture Transfer in Biological Materials—3 cr. (3 and 0)

AgE 873—Radiological Health—3 cr. (2 and 3)

AgE 874—Radiological Health Engineering—3 cr. (2 and 3)

AgE 882—Systems Engineering—3 cr. (2 and 3)

AgE 891—Research—Credit to be arranged.

AgE 901—Special Problems in Agricultural Engineering—3 cr. (3 and 0)

AgE 991—Doctoral Research—Credit to be arranged.

AGRICULTURAL MECHANIZATION

Professors: T. H. Garner, J. T. Ligon, A. W. Snell, *Head;* T. V. Wilson

Associate Professors: J. G. Alphin, C. L. Barth, J. T. Craig, C. E. Hood, Jr., J. R. Lambert, E. B. Rogers, Jr., B. K. Webb

AgM 712—Farm Machinery Management—3 cr. (2 and 3)

AgM 733—Analysis of Agristructures—3 cr. (3 and 0)

AgM 781—Special Topics in Agricultural Mechanization—3 cr. (3 and 0)

AGRICULTURE

Professors: L. P. Anderson, B. D. Barnett, J. R. Hill, Jr., J. W. Jones, W. A. King, W. J. Lanham, J. T. Lazar, Jr., T. L. Senn, R. F. Wheeler

Associate Professors: J. B. Cooper, J. C. Hite, M. W. Jutras, B. J. Skelton, G. R. von Tungeln

Assistant Professor: R. K. DeHaven

Agric 101—Introduction to Agriculture—1 cr. (1 and 0) F, S
Guides to effectively study; agricultural sciences; scope of the agricultural industry; agriculture of South Carolina and the United States; organization and function of the land-grant institution and other agencies serving agriculture; career opportunities.

Agric 201—Introduction to Animal Industries—3 cr. (2 and 3) F, S
Fundamental and descriptive aspects of the animal industries as applied biology and major segments of food production and distribution systems. The subject matter will be presented by Animal Science, Dairy Science, and Poultry Science Departments.

Agric 202—Introduction to Plant Sciences—3 cr. (2 and 3) F, S

A fundamental course in plant sciences, including Agronomic and Horticultural crops of the major agricultural areas of the world, and emphasizing the crops of South Carolina. Included in the laboratory exercises are applications of the basic biological concepts of morphology, heredity, physiology and ecology to the production of food, fiber and ornamentals for an expanding population. The laboratory exercises are mostly self-tutorial; the students take the labs on their own, any time during the semester at their own discretion.

Agric 301—International Agriculture—3 cr. (3 and 0) F

This course is designed to acquaint the student with current international agriculture. Topics covered include: international agricultural production and consumption patterns, stage of agricultural and industrial development in various countries of the world, current and projected future production-consumption-population balance, world trade patterns in agricultural products, world agricultural marketing problems (including tariffs, balance of trade, import quotas, and common markets). Also included are allied subjects such as population trends and agricultural mechanization.

Agric 401—International Agriculture Seminar—1 cr. (1 and 0) S

This seminar will be directed toward current topics in international agriculture. Seminar speakers will include invited guests from such agencies as the Foreign Agricultural Service, the Food and Agriculture Organization, The Ford Foundation, the Rockefeller Foundation, and the Agency for International Development. Other speakers will include staff members in the College of Agriculture and Biological Sciences that have had foreign assignments in their professional fields. Some sessions will be devoted specifically to employment opportunities in international agriculture.

AGRONOMY—CROPS AND SOILS

Professors: L. P. Anderson, *Head;* G. R. Craddock, C. M. Jones, U. S. Jones, T. C. Peele

Associate Professors: E. B. Eskew, B. J. Gossett, W. D. Graham, M. W. Jutras, K. S. LaFleur, J. R. Woodruff

Assistant Professor: J. D. Maxwell

Agron 202—Soils—3 cr. (2 and 2) F, S

A basic foundation in soil science is presented with emphasis on the chemical and physical properties of soil, the activities of the living soil organisms, and the origin and classification of soils. *Prerequisite:* Ch 101, 102, or a geology sequence including Geol 201, or permission of instructor.

Agron 301—Fertilizers—3 cr. (3 and 0) F

Mining, manufacture, and properties of minerals and chemicals that are sources of elements essential for plant growth. How these elements are taken by roots from the soil and converted to plants for food, fiber, shelter, and ornamentals.

Agron 308—Soil and Plant Analysis—3 cr. (1 and 6) S

A laboratory study of the physical and chemical properties of soils and methods of their determination. The relation of these properties to the potential fertility and management of soils is emphasized. Methods of plant analysis and the use of plant analysis data as a diagnostic tool in plant nutrition is also studied. *Prerequisite:* Agron 202.

AGRON 320—FORAGE AND PASTURE CROPS—3 cr. (3 and 0) S
The characteristics, establishment, utilization and maintenance of crops for hay, silage, and pasture. Crops valuable in South Carolina are emphasized. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 322—FORAGE CROPS LABORATORY—1 cr. (0 and 2) S
Identification, rating, and management of the important forage and pasture species of the Southeast. Research methodology is emphasized and a research problem required. *Prerequisite:* Agric 202.

AGRON 402—LAND POLLUTION CONTROL—3 cr. (3 and 0)
Application of the principles of soil science to the use of land for the purpose of disposing of an ever increasing quantity of pollutants and wastes from an ever increasing population of animals, plants, and man. The practices now in use and their limitations will be discussed with regard especially to the maximum capacity of land to consume wastes and its ability to rejuvenate itself. A mission-oriented course to emphasize the quality of land and how it influences the lives of us all. *Prerequisite:* Agron 202, 403, or permission of instructor.

AGRON 403—SOIL GENESIS AND CLASSIFICATION—2 cr. (1 and 3) F
Theoretical and practical phases of soil survey, formation and classification in relation to land usage and plant adaptability. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 405—PLANT BREEDING—3 cr. (2 and 2) S
The application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. *Prerequisite:* Gen 302.

AGRON 407—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2) F
Weeds, their introduction, ecology, methods of reproduction, dissemination, and control; chemistry and mode of action of herbicides, equipment and techniques of application; a characterization of the common weeds of the Southeast. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 410—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0)
S, '73 and alternate years.
History, morphology, physiology, and fundamental principles and practices of production, harvesting, marketing, processing, and utilization of cotton and certain other fiber crops. Emphasis will be placed on the effect of environmental and production factors as they affect fiber quality and subsequent utilization. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 411—GRAIN CROPS—2 cr. (2 and 0) F, '72 and alternate years.
A fundamental study involving principles of production, harvesting, processing, marketing, and utilization of soybeans, corn, sorghum, and the small grains. Emphasis will be placed on factors affecting grain quality as related to utilization of grain. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 412—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0)
S, '74 and alternate years.

Principles involved in the production, harvesting, curing, grading, and marketing of high quality flue-cured tobacco. Brief coverage of special use crops, such as peanuts, sugar cane, etc. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 452—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0) S
Principles of crop rotations, soil fertility, soil management, and other factors necessary for the practical utilization of soils. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 455—SEMINAR—1 cr. (1 and 0) F
Student presentation of current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

AGRON 456—SEMINAR—1 cr. (1 and 0) S
Student presentation of current topics of special interest in the field of soil science appearing in recent scientific journals and other publications.

AGRON 601—FERTILIZERS—3 cr. (3 and 0)

AGRON 602—LAND POLLUTION CONTROL—3 cr. (3 and 0)

AGRON 603—SOIL GENESIS AND CLASSIFICATION—2 cr. (1 and 3)

AGRON 605—PLANT BREEDING—3 cr. (2 and 2)

AGRON 607—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2)

AGRON 608—SOIL AND PLANT ANALYSIS—3 cr. (1 and 6)

AGRON 610—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0)

AGRON 611—GRAIN CROPS—2 cr. (2 and 0)

AGRON 612—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0)

AGRON 620—FORAGE AND PASTURE CROPS—3 cr. (3 and 0)

AGRON 622—FORAGE CROPS LABORATORY—1 cr. (0 and 2)

AGRON 652—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0)

AGRON 655—SEMINAR—1 cr. (1 and 0)

AGRON 656—SEMINAR—1 cr. (1 and 0)

AGRON 801—CROP PHYSIOLOGY AND NUTRITION—3 cr. (3 and 0)

AGRON 802—PEDOLOGY AND SOIL CLASSIFICATION—3 cr. (2 and 3)

AGRON 804—THEORY AND METHODS OF PLANT BREEDING—3 cr. (3 and 0)

AGRON 805—SOIL FERTILITY—3 cr. (3 and 0)

AGRON 806—SPECIAL PROBLEMS—Credit to be arranged.

AGRON 807—SOIL PHYSICS—3 cr. (2 and 3)

AGRON 808—SOIL CHEMISTRY—3 cr. (2 and 3)

AGRON 812—CROP ECOLOGY AND LAND USE—3 cr. (3 and 0)

AGRON 820—PESTICIDE RESIDUES IN THE ENVIRONMENT—3 cr. (3 and 0)

AGRON 825—SEMINAR—1 cr. (1 and 0)

AGRON 891—RESEARCH—Credit to be arranged.

AGRON 991—DOCTORAL RESEARCH—Credit to be arranged.

ANIMAL PHYSIOLOGY

Professors: T. R. ADKINS, JR., B. D. BARNETT, M. A. BOONE, J. R. HILL, JR., W. A. KING, R. F. WHEELER

Associate Professors: J. F. DICKEY, S. B. HAYS, D. M. HENRICKS, J. E. JONES, G. C. SKELLEY, JR., A. S. TOMBES

Assistant Professors: W. E. BACHOP, C. A. GAUTHREAUX, RUTH L. HAYS, J. C. MCCONNELL, JR., R. NOBLET

(See courses listed under Animal Science, Dairy Science, Entomology, Poultry Science, and Zoology)

AN PH 801—ELECTRON MICROSCOPY OF ANIMAL AND PLANT TISSUES—3 cr. (1 and 6)

AN PH 802—DIGESTIVE AND EXCRETORY PHYSIOLOGY—3 cr. (2 and 3)

AN PH 803—CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY—4 cr. (3 and 3)

AN PH 804—MUSCLE AND NERVE PHYSIOLOGY—4 cr. (3 and 3)

AN PH 805—PHARMACOLOGY—3 cr. (2 and 3)

AN PH 806—EXPERIMENTAL ANIMAL PHYSIOLOGY—3 cr. (1 and 6)

AN PH 807—SPECIAL PROBLEMS IN ANIMAL PHYSIOLOGY—1-3 cr.

AN PH 808—MAMMALIAN AND AVIAN ENDOCRINOLOGY—3 cr. (3 and 0)

AN PH 851—ANIMAL PHYSIOLOGY SEMINAR I—1 cr. (1 and 0)

AN PH 852—ANIMAL PHYSIOLOGY SEMINAR II—1 cr. (1 and 0)

AN PH 991—DOCTORAL RESEARCH—Credit to be arranged.

ANIMAL SCIENCE

Professors: W. C. GODLEY, J. R. HILL, JR., R. F. WHEELER, *Head*

Associate Professors: R. L. EDWARDS, G. C. SKELLEY

Assistant Professors: D. L. HANDLIN, J. C. MCCONNELL, JR.

AN SC 201—INTRODUCTION TO ANIMAL SCIENCE—2 cr. (2 and 0)
This course deals with basic principles concerning the breeding, feeding, management and marketing of beef cattle, swine, sheep, and horses.

AN SC 203—INTRODUCTION TO ANIMAL SCIENCE LABORATORY—1 cr. (0 and 3)
A course designed to demonstrate the basic elements of livestock breeding, feeding and management. Beef cattle, swine, sheep, and horses will be used. Evaluation of slaughter animals and carcasses is included.

AN SC 301—FEEDS AND FEEDING—3 cr. (3 and 0) F, S
Feed nutrients, digestion, metabolism of feed stuffs, nutritive ratios, feeding standards, and the balancing of rations. *Prerequisite:* An Sc 201, 203 or equivalent, and Ch 201 or consent of instructor.

An Sc 303—Feeds and Feeding Laboratory—1 cr. (0 and 3) S
Practical work in mixing and balancing rations and identifying feed stuffs. *Prerequisite:* An Sc 201, 203 or equivalent, and Ch 201, or consent of instructor.

An Sc 305—Meat Grading and Selection—2 cr. (1 and 3)
F, '72 and alternate years.
Classification, grading and selection of beef, lamb and pork carcasses, and wholesale cuts. Factors influencing quality and value. Students enrolled in this course are eligible to compete in Intercollegiate Meat Judging Contests. *Prerequisite:* An Sc 201, 203.

An Sc 306—Livestock Selection and Evaluation—2 cr. (1 and 3) S
Selection, breed characteristics and grading of beef cattle, sheep and swine. Students enrolled in this course are eligible to compete in the Southeastern Intercollegiate Livestock Judging Contest. *Prerequisite:* An Sc 201, 203.

An Sc 351—Meat Identification and Utilization—1 cr. (0 and 3)
Selection of meat and identification of cuts, processing techniques, nutritive value, meat preservation, research techniques, muscles, and bones.

An Sc 353—Meats—2 cr. (2 and 0) F
The chemical and physical composition of meat, meat hygiene; nutritive value; curing; freezing; and meat by-products. *Prerequisite:* An Sc 201, 203.

An Sc 355—Meats Laboratory—1 cr. (0 and 3) F
The selection and grading of meat animals and carcasses. Practical work in slaughtering of animals and in the cutting, curing, and freezing of meats. Emphasis is placed on the identification of wholesale and retail cuts. *Prerequisite:* An Sc 201, 203.

An Sc 401—Beef Production—3 cr. (3 and 0) F
Breeding, feeding, management, and grading of beef cattle. Emphasis is placed on year-round grazing. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 403—Beef Production Laboratory—1 cr. (0 and 3) F
Practical application of beef production practices. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 405—Advanced Livestock Selection and Evaluation—1 cr. (0 and 3) F, '73 and alternate years.
A continuation of An Sc 306 for students who are interested in participating in judging contests or in receiving special training in the selection of breeding cattle, sheep, and swine. Judging and grading of market classes are considered. *Prerequisite:* An Sc 306.

An Sc 406—Seminar—2 cr. (2 and 0) S
Special problems in animal production. Each student is given a subject on which he makes weekly reports before a seminar group. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 407—Horse and Sheep Production—2 cr. (2 and 0)
F, '72 and alternate years.
The breeding, feeding, and care of horses and sheep; the shearing and marketing of sheep and wool; the adaptability of breeds; and parasite and disease control. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 408—Pork Production—3 cr. (3 and 0) S
Feeding, breeding, management, and marketing of hogs. Emphasis is placed on winter and summer forages, protein supplements, mineral mixtures, and sanitation practices. In laboratory grading, selection, feeding, management and care of swine is given attention. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 409—Horse and Sheep Production Laboratory—1 cr. (0 and 3) F, '72 and alternate years.
Horse and sheep production practices. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 410—Pork Production Laboratory—1 cr. (0 and 3) S
Practical application of swine production practices. *Prerequisite:* An Sc 301 or consent of instructor.

An Sc 452—Animal Breeding—3 cr. (3 and 0) S
The fundamental principles relating to the breeding and improvement of livestock including variation, heredity, selection, linebreeding, inbreeding, crossbreeding, and other related subjects. *Prerequisite:* Gen 302.

An Sc 601—Beef Production—3 cr. (3 and 0)

An Sc 603—Beef Production Laboratory—1 cr. (0 and 3)

An Sc 608—Pork Production—3 cr. (3 and 0)

An Sc 610—Pork Production Laboratory—1 cr. (0 and 3)

An Sc 652—Animal Breeding—3 cr. (3 and 0)

An Sc 802—Topical Problems—1-3 cr. (1-3 and 0)

An Sc 803—Meat Technology—3 cr. (3 and 0)

An Sc 804—Methods in Animal Breeding—3 cr. (3 and 0)

An Sc 805—Nutrition of Meat Animals—3 cr. (3 and 0)

An Sc 891—Research—Credit to be arranged.

ART AND ARCHITECTURAL HISTORY

Professors: H. N. Cooledge, Jr., V. S. Hodges, R. H. Hunter

Associate Professors: J. T. Acorn, R. D. England, T. E. McPeak, *Head;* I. G. Regnier,* S. Wang

Instructor: T. G. Turner

AAH 215—Architectural History I—3 cr. (3 and 0)
Total Environment: its demands and restrictions, as evidenced by the building and planning of men from ancient times to the present.

AAH 216—Architectural History II—3 cr. (3 and 0)
Continuation of AAH 215.

AAH 302—Art and Architecture Tour—3 cr. (3 and 0)
A tour of selected cities, either foreign or American, will be organized periodically primarily in a Summer Session. The purpose of the tour is to provide students with firsthand experience with the dynamic qualities of

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* On leave.

original works of painting and sculpture and especially the spatial qualities of architecture and the relationships of great works of architecture to their environment. The tour will be accompanied by lectures and will require examinations and/or reports.

AAH 303—The Evolution of the Visual Arts—3 cr. (3 and 0)
A consideration of man's necessity for and development of the Visual Arts with particular attention to the environmental factors in society which demand art as a medium of communication. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* Sophomore standing.

AAH 304—The Evolution of the Environmental Arts—3 cr. (3 and 0)
A consideration of man's necessity for and development of the Environmental Arts (Architecture, Landscape Architecture, City and Regional Planning) with particular attention to the total environment of man and its demands and restrictions upon the architect and planner. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* AAH 303 or permission of instructor.

AAH 315—Architectural History III—3 cr. (3 and 0)
Cultural Focus: its problems and expression, as evidenced by selected examples of architecture and planning from ancient times to the present, considered in depth.

AAH 316—Architectural History IV—3 cr. (3 and 0)
Continuation of AAH 315.

AAH 411—Directed Research in Art History—3 cr. (3 and 0)
Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in art history.

AAH 412—Directed Research in Art History—3 cr. (3 and 0)
Continuation of AAH 411.

AAH 413—Twentieth Century Visual Arts—3 cr. (3 and 0)
A seminar course dealing with twentieth century visual art forms in relation to the factors that have influenced the artist and the consequence of his production on society.

AAH 417—Studies in the Art and Architecture of the Ancient World I—3 cr. (3 and 0)
A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome), with a study in depth of selected examples from the period.

AAH 418—Studies in the Art and Architecture of the Ancient World II—3 cr. (3 and 0)
A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome), with a study in depth of selected examples from the period.

AAH 419—STUDIES IN THE ART AND ARCHITECTURE OF THE EARLY MIDDLE AGES I—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th centuries), with a study in depth of selected examples from the period.

AAH 420—STUDIES IN THE ART AND ARCHITECTURE OF THE EARLY MIDDLE AGES II—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th centuries), with a study in depth of selected examples from the period.

AAH 421—STUDIES IN THE ART AND ARCHITECTURE OF THE LATE MIDDLE AGES I—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th centuries), with a study in depth of selected examples from the period.

AAH 422—STUDIES IN THE ART AND ARCHITECTURE OF THE LATE MIDDLE AGES II—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th centuries), with a study in depth of selected examples from the period.

AAH 423—STUDIES IN THE ART AND ARCHITECTURE OF THE RENAISSANCE I—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period.

AAH 424—STUDIES IN THE ART AND ARCHITECTURE OF THE RENAISSANCE II—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period.

AAH 425—STUDIES IN THE ART AND ARCHITECTURE OF THE TECHNOLOGICAL REVOLUTION I—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Technological Revolution (Western Europe and America from 1685 to 1935), with a study in depth of selected examples from the period.

AAH 426—STUDIES IN THE ART AND ARCHITECTURE OF THE TECHNOLOGICAL REVOLUTION II—3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Technological Revolution (Western Europe and America from 1685 to 1935), with a study in depth of selected examples from the period.

AAH 427—STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL TECHNOLOGY I—3 cr. (3 and 0)

A consideration of the development of architectural technology from ancient through contemporary times with a study in depth of selected examples from each period.

AAH 428—Studies in the Development of Architectural Technology II—3 cr. (3 and 0)
A consideration of the development of architectural technology from ancient through contemporary times with a study in depth of selected examples from each period.

AAH 429—Studies in the Art and Architecture of India and the Far East I—3 cr. (3 and 0)
A consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period.

AAH 430—Studies in the Art and Architecture of India and the Far East II—3 cr. (3 and 0)
A consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period.

AAH 611—Directed Research in Art History—3 cr. (3 and 0)

AAH 612—Directed Research in Art History—3 cr. (3 and 0)

AAH 613—Twentieth Century Visual Arts—3 cr. (3 and 0)

AAH 815—History Seminar I—3 cr. (3 and 0)

AAH 816—History Seminar II—3 cr. (3 and 0)

ARCHITECTURE

Professors: H. E. McClure, G. C. Means, J. L. Young

Associate Professors: K. E. Carpenter, P. Lee, W. A. Phillips, J. E. Pinckney, K. J. Russo, J. R. Washburn, H. H. Williamson,* G. B. Witherspoon, *Head*

Assistant Professors: J. M. Clement, J. E. Dalton, F. K. Mooney

Lecturer: K. R. Craig

Visiting Associate Professor: G. A. Gerster

Arch 101—Architectural Analysis—3 cr. (1 and 6)
An introduction to the elements of architecture with lectures, demonstrations, and limited studio exercises conducted by representative faculty of the major study areas of the College of Architecture.

Arch 102—Architectural Analysis—3 cr. (1 and 6)
Continuation of Arch 101.

Arch 253—Architectural Design I—5 cr. (0 and 15)
Studio work with adjunct demonstrations and lectures concerned with basic architectural design problems. *Prerequisite:* Arch 102 or permission of instructor.

Arch 254—Architectural Design II—5 cr. (0 and 15)
Continuation of Arch 253.

Arch 331—Architectural Applications of Computer Science—2 cr. (2 and 0)
A two-semester course sequence, including computer theory and programming. Architectural applications of the computer as a resource will be studied;

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* On leave.

including use in problem solving in functional relationships of space, materials performance specifications, structural design and graphic usage.

ARCH 332—ARCHITECTURAL APPLICATIONS OF COMPUTER SCIENCE—2 cr. (2 and 0)
A continuation of Arch 331. *Prerequisite:* Arch 331.

ARCH 353—ARCHITECTURAL DESIGN III—5 cr. (0 and 15)
Studio work with adjunct demonstrations and lectures concerned with intermediate architectural design problems. *Prerequisite:* Arch 254.

ARCH 354—ARCHITECTURAL DESIGN IV—5 cr. (0 and 15)
Continuation of Arch 353.

ARCH 403—SEMINAR IN THE ANALYSIS AND CRITICISM OF ARCHITECTURAL AND TOWN BUILDING WORKS—3 cr. (3 and 0)
A seminar in the analysis and criticism of architectural and town building works. The course sequence will include historic and contemporary examples, literary searches, field trips, essays, and oral reports. *Prerequisite:* Fourth year design standing or permission of instructor.

ARCH 415—ARCHITECTURAL HISTORY III—3 cr. (3 and 0)
The architectural history of Western Europe and the Americas from 1453 to 1775, with particular attention to the Renaissance, Baroque, and Revivalist schools. *Prerequisite:* Arch 316.

ARCH 416—ARCHITECTURAL HISTORY IV—3 cr. (3 and 0)
The architectural history of Western Europe and the Americas from 1775 to 1915 with particular attention to the architecture of the Industrial Revolution and the development of the academies. *Prerequisite:* Arch 415.

ARCH 421—ARCHITECTURAL SEMINAR—2 cr. (2 and 0)
A seminar dealing with pertinent topics related to environmental and technological considerations in architecture and the building industry. Conducted by representative faculty of the College of Architecture. *Prerequisite:* Senior standing or permission of instructor.

ARCH 422—ARCHITECTURAL SEMINAR—2 cr. (2 and 0)
Continuation of Arch 421.

ARCH 453—ARCHITECTURAL DESIGN V—5 cr. (0 and 15)
Studio work with adjunct demonstrations and lectures concerned with advanced architectural design problems. *Prerequisite:* Arch 354.

ARCH 454—ARCHITECTURAL DESIGN VI—5 cr. (0 and 15)
Continuation of Arch 453.

ARCH 475—MECHANICAL PLANT—2 cr. (2 and 0)
The water supply, plumbing, heating and ventilating systems of present-day buildings.

ARCH 476—MECHANICAL PLANT—2 cr. (2 and 0)
Air-conditioning, electrical systems, lighting, mechanical transportation and acoustics as applied to contemporary buildings.

ARCH 481—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)
General consideration of architectural office procedure. Study of the professional relationship of the architect to client and contractor, including problems of ethics, law, and business.

ARCH 482—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)
A continuation of Arch 481.

ARCH 490—DIRECTED STUDIES—1-5 cr.
Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in architecture.

ARCH 603—SEMINAR IN THE ANALYSIS AND CRITICISM OF ARCHITECTURAL AND TOWN BUILDING WORKS—3 cr. (3 and 0)

ARCH 675—MECHANICAL PLANT—2 cr. (2 and 0)

ARCH 676—MECHANICAL PLANT—2 cr. (2 and 0)

ARCH 681—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)

ARCH 682—ARCHITECTURAL OFFICE PRACTICE—2 cr. (2 and 0)

ARCH 853—GRADUATE ARCHITECTURAL DESIGN—8 cr. (3 and 15)

ARCH 854—GRADUATE ARCHITECTURAL DESIGN—8 cr. (3 and 15)

ARCH 855—THESIS RESEARCH—2 cr. (0 and 6)

ARCH 857—GRADUATE ARCHITECTURAL DESIGN—10 cr. (4 and 18)

ARCH 858—ARCHITECTURAL THESIS—17 cr. (5 and 36)

ARCH 861—ECONOMIC SEMINARS—3 cr. (3 and 0)

ARCH 890—DIRECTED STUDIES—1-5 cr.

ARCH 891—ARCHITECTURAL STRUCTURAL SEMINAR—2 cr. (2 and 0)

ARCH 892—ARCHITECTURAL STRUCTURAL SEMINAR—2 cr. (2 and 0)

ARCH 893—ARCHITECTURAL STRUCTURES SEMINAR—2 cr. (2 and 0)

ASTRONOMY

Associate Professor: BEVERLY B. BOOKMYER

Assistant Professor: T. F. COLLINS

ASTR 205—DESCRIPTIVE ASTRONOMY—3 cr. (3 and 0)
An elementary survey of astronomy for students not majoring in physical science, mathematics or engineering. A brief history, the solar-planetary system, star clusters, stellar evolution and the Milky Way Galaxy are discussed in a phenomenological rather than technical manner. Planetarium visits will be used to supplement the text.

ASTR 206—DESCRIPTIVE ASTRONOMY LABORATORY—1 cr. (0 and 2)
An introduction to lunar, stellar and planetary observing to aquaint the student with the various celestial objects. Laboratory exercises and planetarium visits will be used to supplement the lecture course. *Prerequisite:* Registration in Astr 205.

Astr 301—General Astronomy—3 cr. (3 and 0)

A study of the astronomical universe for physical science, mathematics or engineering majors. The solar system and celestial coordinates will be emphasized. Planetarium visits and night observing sessions will supplement the text. *Prerequisite:* One year of college physics.

Astr 302—General Astronomy—3 cr. (3 and 0)

A continuation of Astr 301 but with emphasis on stellar and galactic astronomy and cosmology. *Prerequisite:* Astr 301.

Astr 404—Astrodynamics—3 cr. (3 and 0)

Astronomical coordinate systems, orbit determinations, multiple body problems, perturbations, nongravitational and relativistic effects and observational theory. Special attention to problems of artificial satellites. *Prerequisite:* Phys 321.

Astr 604—Astrodynamics—3 cr. (3 and 0)

BIOCHEMISTRY

Associate Professors: D. M. Henricks, D. E. Turk, J. M. Shively, *Head*
Assistant Professors: J. J. Jen, J. K. Zimmerman

Bioch 210—Elementary Biochemistry—4 cr. (3 and 3)

A discussion of the kinds of compounds found in living organisms, their biochemical reactions and significance. The laboratory work parallels classroom study. *Prerequisite:* Ch 102.

Bioch 301—Molecular Biology—3 cr. (3 and 0) F

An introduction to the nature, production, and replication of biological structure at the molecular level, and its relation to function. *Prerequisite:* Organic chemistry.

Bioch 406—Physiological Chemistry—4 cr. (3 and 3)

The chemical basis of the mammalian physiological processes of muscle contraction, nerve function, respiration, kidney function, and blood homeostasis is studied. Composition of specialized tissue such as muscle, nerve, blood and bone, and regulation of water, electrolytes and acid-base balance is discussed. This course is oriented toward the student who needs an introduction to certain aspects of mammalian biochemistry to more fully understand a related discipline. *Prerequisite:* Bioch 210 or organic chemistry.

Bioch 423—Principles of Biochemistry—3 cr. (3 and 0)

The study of the organic chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines and associated compounds leads to a fuller understanding of the chemical properties of proteins, carbohydrates, lipids, and nucleic acids that made them so important in biological processes. Relationships between the structure and function of these molecules and the modern techniques used to establish them are stressed. *Prerequisite:* Ch 224 or equivalent.

Bioch 424—Principles of Biochemistry—3 cr. (3 and 0)

A continuation of Bioch 423.

Bioch 425—General Biochemistry Laboratory—1 cr. (0 and 3)
Experiments selected to illustrate current methods used in biochemical research.

Bioch 426—General Biochemistry Laboratory—1 cr. (0 and 3)
A continuation of Bioch 425.

Bioch 491—Special Problems in Biochemistry—1-3 cr. (0 and 3-9) SS
Orientation, i. e., experimental planning, execution, and reporting in biochemical research. *Prerequisite:* Senior standing.

Bioch 606—Physiological Chemistry—4 cr. (3 and 3)

Bioch 623—Principles of Biochemistry—3 cr. (3 and 0)

Bioch 624—Principles of Biochemistry—3 cr. (3 and 0)

Bioch 625—General Biochemistry Laboratory—1 cr. (0 and 3)

Bioch 626—General Biochemistry Laboratory—1 cr. (0 and 3)

Bioch 810—Advanced Biochemical Techniques—3 cr. (1 and 6)

Bioch 815—Lipids—2 cr. (2 and 0)

Bioch 817—Chemistry and Metabolism of Hormones—2 cr. (2 and 0)

Bioch 819—Intermediary Metabolism—3 cr. (3 and 0)

Bioch 820—Nucleic Acids—2 cr. (2 and 0)

Bioch 821—Proteins—2 cr. (2 and 0)

Bioch 822—Enzymes—3 cr. (3 and 0)

Bioch 823—Carbohydrates—2 cr. (2 and 0)

Bioch 831—Physical Biochemistry—3 cr. (3 and 0)

Bioch 851—Biochemistry Seminar—1 cr. (1 and 0)

Bioch 852—Biochemistry Seminar—1 cr. (1 and 0)

Bioch 871—Advanced Topics—1-3 cr. (1-3 and 0)

Bioch 891—Research—Credit to be arranged.

BIOENGINEERING

Professors: D. W. Bradbury, D. F. Bruley, H. R. Bungay, III, R. C. Harshman, L. C. Wilcox, T. T. Yang

Associate Professors: W. E. Castro, F. W. Cooke, M. J. Eitel, B. E. Gilliland, S. F. Hulbert, *Program Coordinator;* J. S. Wolf, M. L. Wolla

Assistant Professors: D. C. Amoss, J. J. Klawitter, J. S. Love, D. D. Moyle, B. W. Sauer

Adjunct Professors: J. R. Dusenbury, T. S. Hargest, R. R. Moore, J. R. Pruitt, F. H. Stelling

Visiting Professor: H. Metzger

BioE 301—Engineering Aspects of Biology and Medicine—2 cr. (2 and 0)
The relationships of various branches of engineering to biology and medicine. Structural engineering fluid flow, and mass transfer in living systems.

Artificial organs, biomaterials, implants, instrumentation, microbial systems, and other engineering challenges are discussed.

BioE 302—Biomaterials—2 cr. (2 and 0)
Engineering testing and classification of biomaterials (stress, strain, viscosity, impact resistance, ductility, corrosion resistance, wear resistance); prostheses; artificial organs; effect of body environment on synthetic materials; methods for designing new materials. *Prerequisite:* BioE 301.

BioE 305—Survey of Microbial Process Engineering—2 cr. (2 and 0)
The importance of microbial processes to ecology, pollution, industry, and inexpensive foods. Descriptions of large-scale processes. Prospects for unconventional protein sources. Biochemical engineering, elementary process design, mass transfer problems, simple computer models, economic significance, and environmental consequences. *Prerequisite:* BioE 301.

BioE 401—Computers for Bioscientists—1 cr. (1 and 0)
Analog and digital simulation of biochemical and biological processes. Systems approaches, dynamic analysis, interactions between laboratory research and computer models. *Prerequisite:* One semester of calculus or permission of instructor.

BioE 460—Bio-Process Development—2 cr. (1 and 3)
Theory and practice process development for biological operations such as vaccine production, fermentation, microbial conversions, and product isolation. *Prerequisite:* One semester of organic chemistry.

BioE 601—Computers for Bioscientists—1 cr. (1 and 0)

BioE 800—Seminar in Bioengineering—1 cr. (1 and 0)

BioE 801—Biomaterials—3 cr. (3 and 0)

BioE 802—Research Techniques in Biomaterials Evaluation—3 cr. (1 and 6)

BioE 803—Polymers as Biomaterials—3 cr. (3 and 0)

BioE 810—Biochemical Engineering—3 cr. (3 and 0)

BioE 812—Bioelectrochemistry—3 cr. (3 and 0)

BioE 846—Elements of Bioengineering I—3 cr. (3 and 0)

BioE 847—Elements of Bioengineering II—3 cr. (3 and 0)

BioE 850—Special Topics in Biomedical Engineering—3 cr. (3 and 0)

BioE 860—Ecological Models—3 cr. (2 and 3)

BioE 870—Bioinstrumentation—3 cr. (2 and 2)

BioE 871—Bioelectric Phenomena—3 cr. (2 and 2)

BioE 891—Research—Credit to be arranged.

BioE 980—Internship—1-5 cr. (5-0 and 0-40)

BioE 991—Doctoral Research—Credit to be arranged.

BIOLOGY

(For curriculums and offerings see also Biochemistry, Botany, Microbiology, and Zoology)

Biol 101—Principles of Biology—3 cr. (3 and 0) F, S, SS
The chemical, structural, and functional principles of living cells. Consideration of the chemical and physical composition of protoplasm as related to the function of this living material in basic biological processes. The principles of genetics, ecology, and evolution.

Biol 700—Principles of Biology—3 cr. (2 and 3)

Biol 750—Biology for High School Teachers—3 cr. (3 and 0)

Biol 801—Electron Microscopy of Biological Material—3 cr. (3 and 0)

BOTANY

(See also Biology)

Professors: R. P. Ashworth, A. C. Mathews, J. B. Whitney, Jr.

Associate Professor: C. J. Umphlett, *Head*

Assistant Professors: C. R. Dillon, J. E. Fairey, III

Adjunct Associate Professor: N. D. Camper

Bot 102—Principles of Botany—2 cr. (2 and 0) F, S, SS
The application of biological principles to plants as exemplified by the structures and functions of vascular plants. Followed by a survey of the plant kingdom.

Bot 104—Laboratory Exercises in Botany—1 cr. (0 and 2) F, S, SS
Demonstrations and experiments to illustrate the structures and functions of plants considered in Bot 102.

Bot 145—Environmental Dynamics—2 cr. (2 and 0) F
A nontechnical, nonlaboratory course designed to instill a sense of appreciation for the finiteness of our planet and the extent to which it may be exploited. Introduction will be made to basic concepts underlying population growth characteristics, genetic adaptations, energy relationships between producers and consumers, the description of pollutants and their causes and effects. A survey will be made of the various types of environments.

Bot 202—Survey of the Plant Kingdom—4 cr. (3 and 3) S
A survey of the major groups of plants, their structure, development, and reproduction. Evolutionary relationships as exemplified by comparisons of body organization and life cycles will be emphasized. *Prerequisite:* Bot 102.

Bot 352—Plant Physiology—4 cr. (3 and 3) F, S
The relations and processes which have to do with the maintenance, growth and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. *Prerequisite:* Bot 102, Ch 101, 102, Phys 207, or 221, and 223.

Bot H352—Plant Physiology—4 cr. (3 and 3) F, S
Honors option for Bot 352; admission by special arrangement.

Bot 355—Histology—2 cr. (0 and 6)
The principles of fixing, cutting and staining plant tissues and the various other processes of micro-technique and their application to specific forms of plants with emphasis on the flora of South Carolina. *Prerequisite:* Bot 102.

Bot 356—Taxonomy of Vascular Plants—3 cr. (1 and 6) S
The identification, classification, distribution and interrelationship of vascular plants with emphasis on the flora of South Carolina. *Prerequisite:* Bot 101.

Bot H356—Taxonomy of Vascular Plants—3 cr. (1 and 6) S
Honors option for Bot 356; admission by special arrangement.

Bot 404—Cytology—3 cr. (3 and 0) F, '71 and alternate years.
A detailed consideration of the morphology and ultrastructures of cells. *Prerequisite:* Bot 352, Zool 102, 104, or permission of instructor.

Bot H404—Cytology—3 cr. (3 and 3) F, '71 and alternate years.

Bot 406—Plant Anatomy—3 cr. (2 and 3) F, '70 and alternate years.
The origin and development of the organs and tissue systems of vascular plants and a comparative study of the structure of roots, stems, leaves, flowers, and fruits. *Prerequisite:* Bot 102.

Bot H406—Plant Anatomy—3 cr. (2 and 3) F, '70 and alternate years.
Honors option for Bot 406; admission by special arrangement.

Bot 451—Morphology of the Fungi—3 cr. (2 and 3)
F, '70 and alternate years.
The morphology and taxonomy of the fungi, with special emphasis on species of economic importance. *Prerequisite:* Bot 102.

Bot 455—Vascular Plant Morphology—3 cr. (2 and 3) S
Consideration of the structure, reproduction, and phylogenetic relationships of representative vascular plants. *Prerequisite:* Bot 102, 202.

Bot 457—Phycology—3 cr. (2 and 3) S, '71 and alternate years.
The taxonomy, morphology, and ecology of freshwater algae with emphasis on the local flora. *Prerequisite:* Bot 102 or permission of instructor.

Bot H457—Phycology—3 cr. (2 and 3) S, '71 and alternate years.
Honors option for Bot 457; admission by special arrangement.

Bot 459—Plant Ecology—3 cr. (2 and 3) S
The fundamental principles of the relations between plants and their environment. Although autecology is discussed, the basic emphasis throughout the course is synecology. *Prerequisite:* Bot 102.

Bot H459—Plant Ecology—3 cr. (2 and 3) S
The honors option of Bot 459; admission by special arrangement.

Bot 491—Special Problems in Botany—2 cr. (0 and 6)
Research problems in selected areas of botany to provide an introduction to research planning and techniques for Botany majors. *Prerequisite:* Senior standing and permission of the department head.

Bot 604—Cytology—3 cr. (3 and 0)

Bot 606—Plant Anatomy—3 cr. (2 and 3)

Bot 651—Morphology of the Fungi—3 cr. (2 and 3)

Bot 652—Plant Physiology—4 cr. (3 and 3)

Bot 656—Taxonomy of Vascular Plants—3 cr. (1 and 6)

Bot 657—Phycology—3 cr. (2 and 3)

Bot 659—Plant Ecology—3 cr. (2 and 3)

Bot 802—Mycology—4 cr. (3 and 3)

Bot 805—Special Problems in Botany—Credit to be arranged.

Bot 807—Seminar—1 cr. (1 and 0)

Bot 811—Inorganic Plant Metabolism—4 cr. (3 and 3)

Bot 812—Organic Plant Metabolism—3 cr. (3 and 0)

Bot 813—Plant Growth and Development—3 cr. (3 and 0)

Bot 821—Plant Taxonomy I—4 cr. (2 and 6)

Bot 822—Plant Taxonomy II—4 cr. (2 and 6)

Bot 891—Research—Credit to be arranged.

Bot 991—Doctoral Research—Credit to be arranged.

BUILDING SCIENCE

Associate Professors: L. H. Brown, J. L. Clark, A. J. Kaufmann, R. E. Knowland, *Head;* M. G. Melaragno

Instructor: C. L. B. Addison

BldSc 201—Building Science I—3 cr. (3 and 0)
Analysis of physical and environmental requirements of architectural spaces. Consideration of factors and resources involved in the selection of systems materials and controls.

BldSc 202—Building Science II—3 cr. (3 and 0)
Continuation of BldSc 201.

BldSc 241—Construction Organizations and Estimating—5 cr. (2 and 9)
An introduction to the construction process. Evaluation of plans, specifications and resource requirements and preparations of detailed quantity surveys.

BldSc 242—Construction Planning and Scheduling—5 cr. (2 and 9)
Study and analysis of construction projects with specific emphasis on resource planning and manual methods for critical path scheduling. *Prerequisite:* BldSc 241.

BldSc 301—Building Science III—3 cr. (3 and 0)
Theory and design of simple, determinate structures and the design of environmental systems and controls.

BldSc 302—Building Science IV—3 cr. (3 and 0)
Continuation of BldSc 301.

BldSc 341—Construction Data Systems—5 cr. (2 and 9)
An introduction to machine programming. Emphasis on construction applications of data processing equipment and the utilization of existing information systems. *Prerequisite:* BldSc 242.

BldSc 342—Construction Labor Management—5 cr. (2 and 9)
A study of labor-management relations in the construction industry. Evaluation of productivity, incentive methods and bargainings processes. *Prerequisite:* Junior standing.

BldSc 401—Building Science V—4 cr. (3 and 3)
A study of complex structural and environmental systems.

BldSc 402—Building Science VI—4 cr. (3 and 3)
Continuation of BldSc 401.

BldSc 432—Concrete Formwork—2 cr. (2 and 0)
The study of materials, methods design and estimating of formwork for concrete situations. *Prerequisite:* EM 304 or BldSc 301.

BldSc 441—Construction Economics—5 cr. (2 and 9)
A study of construction economics with specific emphases on capital budgeting, decision making and investment theory. *Prerequisite:* Acct 202, Econ 202.

BldSc 442—Construction Management—5 cr. (2 and 9)
Preparation of detailed estimates, resource allocation, scheduling and contractural documents. Comprehensive studies and research in special topics selected by individual students.

CERAMIC ARTS

Professor: G. C. Robinson

Associate Professor: H. G. Lefort

Cr Ar 101—Pottery Materials—3 cr. (2 and 3)
The occurrence and properties of pottery raw materials. Attention is devoted to the occurrence of natural pottery materials in South Carolina, and the methods and equipment used in preparing these materials.

Cr Ar 102—Pottery Drying and Firing—3 cr. (3 and 0)
The drying and firing processes used in pottery making. A discussion is included on the design and construction of simple pottery kilns and the student is required to build and operate a small outdoor kiln. The laboratory work demonstrates the drying and firing behavior of pottery.

Cr Ar 301—Pottery Glazes—3 cr. (3 and 0)
The materials and methods used in preparing glazes and a study of the methods used in decorating pottery products. *Prerequisite:* Cr Ar 101, 102.

Cr Ar 401—Advanced Pottery—3 cr. (2 and 3)
An advanced study of clay and pottery materials designed to use science to understand creative pottery techniques. Included are understanding clay material workability and forming techniques, the physical aspects of finishing formed ware and also of drying, the function of auxiliary pottery materials, heat and temperature measurements, the chemistry and physical aspects of firing, glazing, jewelry enameling, kiln, and other pottery equipment construction with emphasis on topics useful to teachers in establishing school laboratories. Not open to engineering students.

Cr Ar 601—Advanced Pottery—3 cr. (2 and 3)

CERAMIC ENGINEERING

Professors: G. C. Robinson, *Head;* H. H. Wilson

Associate Professors: W. W. Coffeen, C. C. Fain, H. G. Lefort

CrE 201—Introduction to Ceramic Engineering—2 cr. (2 and 0)

An introduction to ceramic engineering together with a study of ceramic forming operation. Exercises are provided in the analysis of processing problems, the evaluation of background information and the creation of new solutions to processing problems.

CrE 202—Ceramic Materials—3 cr. (3 and 0)

The properties and uses of commonly used ceramic materials. Equilibrium diagrams are used to gain an understanding of the effect of heat on the materials.

CrE 204—Laboratory Procedures—1 cr. (0 and 3)

An introduction to ceramic laboratory procedures. Primary consideration will be given to the evaluation of sources of error and signifiance of measurement in the major ceramic test procedures.

CrE 299—Digital Computation—1 cr. (0 and 3)

An introduction to digital computer programming for students majoring in Ceramic Engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in ceramic engineering. *Prerequisite:* Sophomore standing.

CrE 302—Thermo-Chemical Ceramics—3 cr. (3 and 0)

High-temperature equilibrium using the laws of physical chemistry as applied to ceramic systems in both solid and liquid states. An introduction to the crystal chemistry of ceramic raw materials, and the effect of crystalline form on their high-temperature behavior.

CrE 303—Ceramic Products—2 cr. (2 and 0)

The application of ceramic products to a variety of use environments. Refractories, structural ceramics, coated metals and corrosion-resistant products are included. The course is for both engineering and nonengineering majors.

CrE 304—Experiment Design—1 cr. (0 and 3)

An exercise in the planning and organization of experiments in the ceramic field.

CrE 306—Fuels Combustion and Heat Transfer—1 cr. (0 and 3)

Combustion devices, the calculation of combustion problems and heat transfer.

CrE 307—Thermal Processing of Ceramics—3 cr. (3 and 0)

The accomplishment of changes in structure and composition through the application of thermal energy. The course includes a study of simultaneous transfer of heat and mass, fluid flow, determinants of rates in a variety of reactions and calculations of the energy requirements to accomplish change in structure or composition.

CrE 309—Research Methods—2 cr. (0 and 6)

The planning and solution of selected research problems.

CrE 310—Introduction to Material Science—3 cr. (3 and 0)

A beginning course in material science designed primarily for engineering students. The course is a study of the relation between the electrical, mechanical and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms.

CrE 402—Solid State Ceramics—3 cr. (3 and 0)

The effects of the composition, form, and shape of ceramic raw materials on the manufacturing processes and final properties of ceramic products. Included are fundamental studies of such phenomena as deflocculation, plasticity, sintering and the behavior of ceramic products in electrical circuits. *Prerequisite:* Junior standing.

CrE 403—Glasses—3 cr. (3 and 0)

Glass structure and composition and their relation to the properties of glasses. Consideration is given to the processing variables which control the properties of glasses including glass products, enamels, glazes, and vitreous bonds.

CrE 404—Ceramic Coatings—3 cr. (3 and 0)

The raw materials, methods of manufacture, and properties of ceramic coatings. *Prerequisite:* CrE 302.

CrE 406—Ceramic Project—2 cr. (0 and 6)

The completion of an original research into a ceramic problem. *Prerequisite:* CrE 302.

CrE 407—Plant Design—3 cr. (1 and 6)

The application of the fundamentals of ceramic engineering to problems in plant design. *Prerequisite:* Senior standing in Ceramic Engineering.

CrE 410—Analytical Processes—3 cr. (2 and 3)

An introductory course on the theory and use of X-ray diffraction and spectroscopic methods. *Prerequisite:* Junior standing.

CrE 412—Raw Material Preparation—3 cr. (3 and 0)

The equipment and processes used in the crushing and grinding of raw materials, the separation and classification of particle sizes, and the separation and purification of minerals by mineral dressing methods.

CrE 416—Electronic Ceramics—3 cr. (3 and 0)

The theory and measurement of the electronic properties of ceramic products.

CrE 418—Process Control—3 cr. (3 and 0)

Process control techniques and apparatus with particular emphasis on temperature measurement and control systems. The application of laboratory techniques to the control of product quality and process efficiency is included. *Prerequisite:* Junior standing.

CrE 419—Science of Engineering Materials—3 cr. (3 and 0)

This course is planned to acquaint engineers with the thermal, electrical, and chemical characteristics of engineering materials. It emphasizes fundamental consideration of the structure of matter in the solid and glassy states, solid state reactions, and the influence of particle and aggregate structure to speed of reaction and product properties. The reasons for the properties of materials at elevated temperatures and room temperatures are related to these fundamentals.

CrE H419—Science of Engineering Materials—3 cr. (3 and 0)
Same as CrE 419 except that this honors section is open to students only by invitation.

CrE 420—Science of Engineering Materials—3 cr. (3 and 0)
A continuation of CrE 419 with emphasis on applications of fundamentals in nuclear reactors and nuclear power plants. Consideration is given to the development of ceramics for fuel elements, moderator materials, control rods, shielding and in radioactive waste disposal.

CrE 421—Experiments in Material Science for Teachers—3 cr. (2 and 3)
Many of the topics in the earth science, physical science, physics and chemistry courses of grammar school and high school have interesting application in research and production of engineering materials. A series of experiments have been developed which support specific topics in grammar and high school science courses. These experiments have been designed to be suitable for use in schools and with equipment usually present in school laboratories. The laboratory part of this course is devoted to providing the students with experience and background in these experiments while the lecture topics include consideration of the thermal, electrical, chemical properties of materials as determined by their composition and structure. This course has been prepared especially for elementary and high school teachers of science, and is not open to engineering students.

CrE 602—Solid State Ceramics—3 cr. (3 and 0)

CrE 603—Glasses—3 cr. (3 and 0)

CrE 604—Ceramic Coatings—3 cr. (3 and 0)

CrE 610—Analytical Processes—3 cr. (2 and 3)

CrE 612—Raw Material Preparation—3 cr. (3 and 0)

CrE 616—Electronic Ceramics—3 cr. (3 and 0)

CrE 618—Process Control—3 cr. (3 and 0)

CrE 619—Science of Engineering Materials—3 cr. (3 and 0)

CrE 620—Science of Engineering Materials—3 cr. (3 and 0)

CrE 621—Experiments in Material Science for Teachers—3 cr. (2 and 3)

CrE 701—Special Problems—3 cr. (1-3 and 0)

CrE 807—Specialized Ceramics—3 cr. (3 and 0)

CrE 809—High-Temperature Materials—3 cr. (3 and 0)

CrE 810—Ceramic Engineering Thermodynamics—3 cr. (3 and 0)

CrE 811—Ceramic Engineering Kinetics—3 cr. (3 and 0)

CrE 812—Current Topics in Ceramic Engineering—1 cr. (1 and 0)

CrE 813—Nuclear Ceramics—3 cr. (3 and 0)

CrE 814—Ceramic Physical Processing—3 cr. (3 and 0)

CrE 815—Colloidal and Surface Science—3 cr. (3 and 0)

CRE 816—CONSTITUTION AND STRUCTURE OF GLASSES—3 cr. (3 and 0)

CRE 821—ANALYTICAL PROCEDURES AND EQUIPMENT I—3 cr. (2 and 3)

CRE 822—ANALYTICAL PROCEDURES AND EQUIPMENT II—3 cr. (2 and 3)

CRE 823—THERMAL PROPERTIES OF CERAMIC MATERIALS—3 cr. (3 and 0)

CRE 824—MECHANICAL PROPERTIES OF CERAMIC MATERIALS—3 cr. (3 and 0)

CRE 825—MAGNETIC AND ELECTRICAL CERAMIC MATERIAL—3 cr. (3 and 0)

CRE 826—CERAMIC COATINGS—3 cr. (3 and 0)

CRE 828—SOLID STATE CERAMIC SCIENCE—3 cr. (3 and 0)

CRE 891—RESEARCH—Credit to be arranged.

CHEMICAL ENGINEERING

Professors: F. C. ALLEY, W. B. BARLAGE, D. F. BRULEY, J. W. HALL, R. C. HARSHMAN, C. E. LITTLEJOHN, *Head*

Associate Professors: W. F. BECKWITH, J. C. MULLINS

Assistant Professors: J. N. BEARD, S. S. MELSHEIMER

CHE 201—INTRODUCTION TO CHEMICAL ENGINEERING—3 cr. (2 and 3)
An introduction to the concepts of chemical engineering and a study of PVT relations for gases and vapors, material and energy balances, equilibria in chemical systems, and combined material and energy balances. *Prerequisite:* Ch 102.

CHE 202—STAGEWISE SEPARATION OPERATIONS—4 cr. (3 and 3)
A first course in the theory and design of separation operations using the stagewise technique. Specific operations studied will be distillation and solvent extraction. A feature of the course is the inclusion of engineering graphical communication by sketching of laboratory separations equipment. *Prerequisite:* ChE 201.

CHE 210—DIGITAL COMPUTATION AND NUMERICAL METHODS—3 cr. (3 and 0)
An introduction to digital computational techniques using a specific procedure oriented language and the use of numerical methods for the solution of chemical engineering problems. The course will introduce students to computational methods to be used in subsequent chemical engineering courses. *Prerequisite:* ChE 201, Math 108.

CHE 301—UNIT OPERATIONS THEORY I—3 cr. (3 and 0)
The general principles of chemical engineering and a study of the following unit operations: Fluid Flow, Fluid Transportation, Heat Transmission and Evaporation. Special emphasis is placed on theory and its practical application to design. *Prerequisite:* ChE 202, and Junior standing.

CHE 302—UNIT OPERATIONS THEORY II—3 cr. (3 and 0)
A study of selected unit operations based on diffusional phenomena. Primary attention will be given to differential contact operations such as absorption, humidification, and gas-liquid contact. *Prerequisite:* ChE 301 and Junior standing.

ChE 306—Unit Operations Laboratory I—1 cr. (0 and 3)

Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is laid on the relation between theory and experimental results and on report writing. *Prerequisite:* ChE 301 and Junior standing.

ChE 331—Chemical Engineering Thermodynamics I—3 cr. (3 and 0)

A first basic course in static equilibria. Topics include the First and Second Law of Thermodynamics, real and ideal gases, thermodynamic properties of fluids, phase changes, and heats of reaction. *Prerequisite:* Ch 331, ChE 202, Math 208, and Junior standing; or permission of the department head.

ChE H331—Chemical Engineering Thermodynamics I—3 cr. (3 and 0)

Honors section of ChE 301; admission by invitation.

ChE 352—Chemical Engineering Systems Analysis—4 cr. (3 and 3)

Mathematical modeling of lumped and distributed parameter chemical engineering systems and analog computer solutions. The modeling of large-scale systems and an introduction to optimization. *Prerequisite:* Junior standing in Chemical Engineering or permission of instructor.

ChE 401—Transport Phenomena—3 cr. (3 and 0)

Heat, mass, and momentum transport with emphasis being laid on how the three processes are related. A firmer theoretical foundation is laid for the previous work in unit operations. *Prerequisite:* ChE 302 and Senior standing.

ChE H401—Transport Phenomena—3 cr. (3 and 0)

Honors section of ChE 401; admission by invitation.

ChE 407—Unit Operations Laboratory II—2 cr. (0 and 6)

Laboratory work for the diffusional unit operations. Competent technical reports are required. *Prerequisite:* Enrollment in ChE 401 and Senior standing.

ChE 415—Introduction to Nuclear Engineering I—3 cr. (3 and 0)

Designed to acquaint the nonnuclear engineer with some of the engineering aspects of nuclear science. Topics include a brief survey of particle physics; nuclear reactions; energy transformations; nuclear reactors, their design, construction and use; radiation damage to materials of construction; and special problems in nuclear engineering peculiar to the basic engineering disciplines. *Prerequisite:* Junior or Senior standing in engineering, chemistry, or physics.

ChE 416—Introduction to Nuclear Engineering II—3 cr. (3 and 0)

A continuation of ChE 415, topics to include reactor principles, plutonium production, reactor types, materials of reactor construction, control instruments, and waste disposal. *Prerequisite:* ChE 415.

ChE 421—Process Development, Design, and Optimization of Chemical Engineering Systems I—3 cr. (2 and 3)

A study of the steps in creating a chemical process design from the original concept to successful completion and operation of the plant. Topics include engineering economics, systems analysis, simulation, optimization, process equipment sizing and selection, and the application of analog and digital computers. *Prerequisite:* Completion of all required 200- and 300-level courses in chemistry, chemical engineering, and mathematics.

ChE 422—Process Development, Design, and Optimization of Chemical Engineering Systems II—3 cr. (0 and 9)

A continuation of ChE 421. The principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. *Prerequisite:* ChE 401, 421, 430, 450.

ChE 424—Introduction to Industrial Pollution—3 cr. (3 and 0)

An introduction to air and water pollution problems associated with chemical processing transportation, and power generation. Basic processes and mechanisms utilized in the control of liquid and gaseous wastes are discussed from a standpoint of equipment design and economics. Present and future trends in pollution legislation are reviewed. *Prerequisite:* Senior standing in chemical engineering, or permission of instructor.

ChE 425—Chemical Process Engineering—3 cr. (3 and 0)

An advanced treatment of chemical engineering unit operations and unit processes. The course is designed to give the undergraduate more depth in these areas. *Prerequisite:* Permission of instructor.

ChE 430—Chemical Engineering Thermodynamics II—3 cr. (3 and 0)

A continuation of ChE 331. Subjects include heat engines, compressors, refrigeration, phase equilibria, and chemical reaction equilibria. *Prerequisite:* ChE 331 and Senior standing.

ChE 440—Senior Inspection Trip—0 cr.

A three- or four-day trip is made to visit selected chemical plants. Using lectures by plant personnel supplemented by conducted tours of chemical plant installations, the student is introduced to current industrial practice. *Prerequisite:* Senior standing in chemical engineering.

ChE 450—Chemical Engineering Kinetics—3 cr. (3 and 0)

An introduction to the kinetics of chemical reactions. Topics include homogeneous and heterogeneous reactions, batch and flow reaction systems, catalysis, and design of industrial reactors. *Prerequisite:* Senior standing in chemical engineering or permission of department head.

ChE 452—Molecular and Turbulent Transport—3 cr. (3 and 0)

A theoretical treatment of the fundamental mechanisms of molecular and turbulent heat, mass, and momentum transport with the major emphasis given to the interrelation of all three mechanisms. Evaluation and correlation of transport properties and both steady state and unsteady state processes are considered. An elective course for nonchemical engineering students. *Prerequisite*: Senior standing in chemistry, engineering, or physics, and Math 208.

ChE 453—Process Dynamics—3 cr. (3 and 0)

Basic process control and the effect of feedback in various systems. The mathematical analysis of the dynamic response of process systems to step and sinusoidal changes. Determination of the optimum settings for various combinations of proportional, reset and derivative control. *Prerequisite:* Junior or Senior standing in engineering, physics, or chemistry, and Math 309, or permission of department head.

ChE 491—Special Projects in Chemical Engineering—1-3 cr. (1-3 and 0)

As a need arises, special topics requested by students or offered by the faculty will be taught. Review of current research in an area, technological advances and national engineering goals are possible topic areas.

ChE H491—Special Projects in Chemical Engineering—1-3 cr. (1-3 and 0)

Honors Section of ChE 491; admission by invitation.

ChE 601—Transport Phenomena—3 cr. (3 and 0)

ChE 607—Unit Operations Laboratory II—2 cr. (0 and 6)

ChE 615—Introduction to Nuclear Engineering I—3 cr. (3 and 0)

ChE 616—Introduction to Nuclear Engineering II—3 cr. (3 and 0)

ChE 621—Process Development, Design, and Optimization of Chemical Engineering Systems—3 cr. (2 and 3)

ChE 622—Process Development, Design, and Optimization of Chemical Engineering Systems II—3 cr. (0 and 9)

ChE 625—Chemical Process Engineering—3 cr. (3 and 0)

ChE 630—Chemical Engineering Thermodynamics II—3 cr. (3 and 0)

ChE 650—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 652—Molecular and Turbulent Transport—3 cr. (3 and 0)

ChE 653—Process Dynamics—3 cr. (3 and 0)

ChE 802—Process Dynamics and Control—3 cr. (3 and 0)

ChE 803—Heat, Mass, and Momentum Transfer—3 cr. (3 and 0)

ChE 804—Chemical Engineering Thermodynamics—3 cr. (3 and 0)

ChE 805—Chemical Engineering Kinetics—3 cr. (3 and 0)

ChE 806—Chemical Engineering Calculations I—3 cr. (3 and 0)

ChE 807—Chemical Engineering Calculations II—3 cr. (3 and 0)

ChE 808—Chemical Engineering Design and Analysis—3 cr. (1 and 6)

ChE 809—Waste Treatment—3 cr. (3 and 0)

ChE 810—Biochemical Engineering—3 cr. (3 and 0)

ChE 821—Heat Transport—3 cr. (3 and 0)

ChE 822—Mass Transfer and Differential Contact Operations—3 cr. (3 and 0)

ChE 823—Mass Transfer and Stagewise Contact Operations—3 cr. (3 and 0)

ChE 830—Chemical Technology—3 cr. (3 and 0)

ChE 840—Graduate Laboratory—Credit to be arranged.

ChE 845—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

ChE 846—Selected Topics in Chemical Engineering—3 cr. (3 and 0)

CHE 847—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 852—AIR POLLUTION CONTROL PROCESSES—3 cr. (3 and 0)

CHE 853—INDUSTRIAL AIR HYGIENE—3 cr. (3 and 0)

CHE 854—ENVIRONMENTAL INSTRUMENTATION AND MEASUREMENTS—3 cr. (2 and 3)

CHE 891—RESEARCH—Credit to be arranged.

CHE 902—PROCESS DYNAMICS AND CONTROL—3 cr. (3 and 0)

CHE 903—TRANSPORT PHENOMENA—3 cr. (3 and 0)

CHE 904—CHEMICAL ENGINEERING THERMODYNAMICS—3 cr. (3 and 0)

CHE 905—CHEMICAL ENGINEERING KINETICS—3 cr. (3 and 0)

CHE 945—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 946—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 947—SELECTED TOPICS IN CHEMICAL ENGINEERING—3 cr. (3 and 0)

CHE 954—ENVIRONMENTAL SYSTEMS DESIGN—3 cr. (3 and 0)

CHE 991—DOCTORAL RESEARCH—Credit to be arranged.

CHEMISTRY

Professors: J. C. FANNING, J. H. HOBSON, J. W. HUFFMAN, F. J. LINDSTROM, A. R. PINDER, H. T. POLK, G. B. SAVITSKY, H. G. SPENCER, *Head*

Associate Professors: J. F. ALLEN, C. B. BISHOP, F. B. BROWN, N. P. MARULLO, J. R. SALLEY, JR., J. L. VON ROSENBERG, JR.

Assistant Professors: J. R. BACON, R. H. BAILEY, JR., A. L. BEYERLEIN, MURIEL B. BISHOP, J. F. GELDARD, O. J. JACOBUS, K. S. LANDERS, G. L. POWELL

CH 101—GENERAL CHEMISTRY—4 cr. (3 and 3)
Students are introduced to the elementary concepts of chemistry through classroom and laboratory experience. The course emphasizes chemical reactions and the use of symbolic representation, the mole concept and its applications, and molecular structure. *Prerequisite:* Registration in Math 101, 103, or 106.

CH 102—GENERAL CHEMISTRY—4 cr. (3 and 3)
A continuation of Ch 101 which includes solutions, rates of reactions, chemical equilibrium, electrochemistry, survey of some elements and their chemistry, and an introduction to organic chemistry. The laboratory includes the qualitative analysis of selected elements. Recommended for students taking one year of chemistry or continuing in Ch 201.

CH H102—GENERAL CHEMISTRY—4 cr. (3 and 3)
Same as Ch 102 except that this honors section is open to students by invitation only.

CH 112—GENERAL CHEMISTRY—4 cr. (3 and 3)
A continuation of Ch 101 which emphasizes solutions, thermodynamic concepts, kinetics and oxidation-reduction reactions. The laboratory empha-

sizes solution chemistry and qualitative analyses. Recommended for students continuing in Ch 223.

Ch 201—General Chemistry—4 cr. (3 and 3)
A continuation of Ch 102 which extends the introduction to organic chemistry and includes the chemistry of carbohydrates, lipids, and proteins and their role in metabolic processes. *Prerequisite:* Ch 102 or permission of instructor.

Ch 223—Organic Chemistry—3 cr. (3 and 0)
An introductory course covering the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. *Prerequisite:* Ch 112 or permission of instructor.

Ch 224—Organic Chemistry—3 cr. (3 and 0)
A continuation of Ch 223.

Ch 225—Organic Chemistry Laboratory—2 cr. (0 and 6)
The laboratory techniques involved in the synthesis, separation and purification, and characterization of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

Ch 226—Organic Chemistry Laboratory—2 cr. (0 and 6)
A continuation of Ch 225. *Prerequisite:* Registration in Ch 224.

Ch 227—Organic Chemistry Laboratory—1 cr. (0 and 3)
The synthesis and properties of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

Ch 228—Organic Chemistry Laboratory—1 cr. (0 and 3)
A continuation of Ch 227. *Prerequisite:* Registration in Ch 224.

Ch 229—Organic Chemistry Laboratory—1 cr. (0 and 3)
A one-semester laboratory for chemical engineering students. *Prerequisite:* Registration in Ch 224.

Ch 313—Quantitative Analysis—3 cr. (3 and 0)
The fundamental principles of volumetric, gravimetric and certain elementary instrumental chemical analyses. *Prerequisite:* Organic chemistry.

Ch 315—Quantitative Analysis Laboratory—2 cr. (0 and 6)
The laboratory techniques of volumetric, gravimetric, and elementary instrumental analysis.

Ch 317—Quantitative Analysis Laboratory—1 cr. (0 and 3)
The standard techniques of analytical chemistry—gravimetric, volumetric, and instrumental.

Ch 331—Physical Chemistry—3 cr. (3 and 0)
Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. *Prerequisite:* Math 206, physics.

Ch 332—Physical Chemistry—3 cr. (3 and 0)
Continuation of Ch 331 including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces.

Ch 339—Physical Chemistry Laboratory—1 cr. (0 and 3)
Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. *Prerequisite:* Registration in Ch 331.

Ch 340—Physical Chemistry Laboratory—1 cr. (0 and 3)
A continuation of Ch 339. *Prerequisite:* Registration in Ch 332.

Ch 402—Inorganic Chemistry—3 cr. (3 and 0)
A comprehensive survey of the field of inorganic chemistry through lectures and lecture experiments. Development of modern theories of atomic structure and valence, and a detailed study of the elements and their compounds, based on the periodic system and including both well-known and rarer elements. *Prerequisite:* Ch 331, 332.

Ch 403—Inorganic Chemistry—3 cr. (3 and 0)
A continuation of Ch 402 with emphasis on the synthesis and properties of inorganic compounds. *Prerequisite:* Ch 402.

Ch 411—Instrumental Analysis—4 cr. (2 and 6)
Demonstration and operation of modern optical and electronic precision-measuring devices as they apply to the processes and analytical, physical and organic chemistry. *Prerequisite:* Physical chemistry.

Ch 421—Advanced Organic Chemistry—3 cr. (3 and 0)
A survey of modern organic chemistry with an emphasis on synthesis and mechanism. *Prerequisite:* Ch 224, 332, or equivalent.

Ch 422—Advanced Organic Chemistry Laboratory—2 cr. (0 and 6)
Modern laboratory techniques are used in the synthesis and identification of organic compounds. *Prerequisite:* Registration in Ch 421 or permission of instructor.

Ch 428—Organic Spectroscopy—3 cr. (2 and 2)
A survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasis is on interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared and mass spectroscopy, optical rotatory dispersion and circular dicroism. Two hours theory and two hours practical problem solving per week. *Prerequisite:* Organic and physical chemistry.

Ch 435—Atomic and Molecular Structure—3 cr. (3 and 0)
An introduction to the principles of wave mechanics as applied to various forms of spectroscopy and the elucidation of molecular structure. Emphasis is placed upon the quantum aspects of electronic, vibrational, and rotational transitions as well as nuclear magnetic resonance, the Raman effect and photoelectron spectroscopy.

Ch 436—Physical Chemistry Laboratory—1 cr. (0 and 3)
To be taken in conjunction with Ch 435. Experiments in various areas of spectroscopy are designed for quantitative interpretation of data. Students also gain familiarity with some spectroscopic instruments.

CH 441—GLASS MANIPULATION—2 cr. (0 and 6)
A course designed to teach the fundamentals of glass manipulation and its application to the construction and repair of simple laboratory apparatus. *Prerequisite:* Senior standing.

CH 442—CHEMICAL LITERATURE—1 cr. (1 and 0)
This course is designed to give the student practice in the use of chemical literature, the writing of technical reports and the presentation of same before the faculty of the Department of Chemistry. *Prerequisite:* Junior standing in chemistry.

CH 443—RESEARCH PROBLEMS—3 cr. (0 and 9)
Original investigation of an assigned problem in a fundamental branch of chemistry. This work must be carried out under the supervision of a member of the staff. *Prerequisite:* Senior standing in chemistry.

CH 444—RESEARCH PROBLEMS—3 cr. (0 and 9)
A continuation of Ch 443.

CH 454—INORGANIC SYNTHESIS—2 cr. (0 and 6)
A laboratory course designed to acquaint the student with various methods and techniques employed in the preparation and handling of inorganic compounds.

CH 472—ORGANIC SYNTHESIS—4 cr. (2 and 6)
A course designed to teach the student techniques and principles as applied in a research laboratory. Both macro and semi-macro methods are used in the preparation of several organic compounds. *Prerequisite:* Organic chemistry.

CH 491—INTRODUCTION TO RADIOCHEMISTRY—3 cr. (2 and 3)
The natural and synthetic radioisotopes, including the consideration of atomic and nuclear structure, properties of radiation and tracer techniques and their application. The laboratory is concerned with the methods of detection and measurement of the various types of radiation and the various applications of tracer techniques. *Prerequisite:* Senior or Graduate standing and permission of instructor.

CH 602—INORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 603—INORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 611—INSTRUMENTAL ANALYSIS—4 cr. (2 and 6)

CH 613—QUANTITATIVE ANALYSIS—3 cr. (3 and 0)

CH 615—QUANTITATIVE ANALYSIS LABORATORY—2 cr. (0 and 6)

CH 617—QUANTITATIVE ANALYSIS LABORATORY—1 cr. (0 and 3)

CH 621—ADVANCED ORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 622—ADVANCED ORGANIC CHEMISTRY LABORATORY—2 cr. (0 and 6)

CH 628—ORGANIC SPECTROSCOPY—3 cr. (2 and 2)

CH 631—PHYSICAL CHEMISTRY—3 cr. (3 and 0)

CH 632—PHYSICAL CHEMISTRY—3 cr. (3 and 0)

CH 635—ATOMIC AND MOLECULAR STRUCTURE—3 cr. (3 and 0)

CH 636—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 639—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 640—PHYSICAL CHEMISTRY LABORATORY—1 cr. (0 and 3)

CH 654—INORGANIC SYNTHESIS—2 cr. (0 and 6)

CH 672—ORGANIC SYNTHESIS—4 cr. (2 and 6)

CH 691—INTRODUCTION TO RADIOCHEMISTRY—3 cr. (2 and 3)

CH 700—PHYSICAL SCIENCE FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

CH 701—REVIEW OF GENERAL CHEMISTRY I—3 cr. (3 and 0)

CH 702—REVIEW OF GENERAL CHEMISTRY II—3 cr. (2 and 3)

CH 805—THEORETICAL INORGANIC CHEMISTRY—3 cr. (3 and 0)

CH 806—SPECIAL TOPICS IN INORGANIC CHEMISTRY—1-4 cr.

CH 807—CHEMISTRY OF THE TRANSITION ELEMENTS—3 cr. (3 and 0)

CH 808—CHEMISTRY OF THE NONMETALLIC ELEMENTS—3 cr. (3 and 0)

CH 811—ANALYTICAL CHEMISTRY—3 cr. (3 and 0)

CH 812—CHEMICAL SPECTROSCOPIC METHODS—3 cr. (2 and 3)

CH 814—ELECTROANALYTICAL CHEMISTRY—3 cr. (2 and 3)

CH 821—ORGANIC CHEMISTRY I—3 cr. (3 and 0)

CH 822—ORGANIC CHEMISTRY II—3 cr. (3 and 0)

CH 823—ORGANIC REACTION MECHANISMS—3 cr. (3 and 0)

CH 824—FUNDAMENTAL PRINCIPLES OF POLYMER CHEMISTRY—3 cr. (3 and 0)

CH 825—CURRENT TOPICS IN ORGANIC CHEMISTRY—1 cr. (1 and 0)

CH 831—CHEMICAL THERMODYNAMICS—3 cr. (3 and 0)

CH 834—STATISTICAL THERMODYNAMICS—3 cr. (3 and 0)

CH 835—CHEMICAL KINETICS—3 cr. (3 and 0)

CH 837—QUANTUM CHEMISTRY—3 cr. (3 and 0)

CH 851—SEMINAR—0-2 cr.

CH 861—PRINCIPLES OF BIOCHEMISTRY—3 cr. (3 and 0)

CH 891—RESEARCH—Credit to be arranged.

CH 920—ADVANCED TOPICS IN ORGANIC CHEMISTRY—1-4 cr. (1-4 and 0)

CH 930—ADVANCED TOPICS IN PHYSICAL CHEMISTRY—1-4 cr. (1-4 and 0)

CH 950—MICROANALYTICAL TECHNIQUES—3 cr. (1 and 6)

CH 991—DOCTORAL RESEARCH—Credit to be arranged.

CITY AND REGIONAL PLANNING

Professors: S. Carter, E. L. Falk, *Acting Head;* V. S. Hodges
Visiting Associate Professor: R. D. Bray

CRP 411—Introduction to City and Regional Planning—3 cr. (3 and 0)
Overview of urban land-use planning. Analysis of current work in each significant phase of planning. Discussion of goal formulation, foundation studies, land-use planning methods and considerations, and continuing evaluation and modification of an urban-planning process.

CRP 412—City and Regional Planning Theory—3 cr. (3 and 0)
The philosophical, methodological, and ethical aspects of planning will be explored through selected readings, student reports, lectures and discussion. A critical examination of current planning theories.

CRP 421—Urban Social Structure—3 cr. (3 and 0)
The social, economic, and political aspects of communities of varying sizes and types. Elements will include housing, education, recreation, social services, governmental structure, and related community institutions.

CRP 441—History of Planning—3 cr. (3 and 0)
The development of the urban plan from ancient to modern times.

CRP 472—Planning Administration and Practice—3 cr. (3 and 0)
The organization and administration of types of planning agencies and their relationship to other governmental and private organizations.

CRP 473—Government and Planning Law—3 cr. (3 and 0)
A complete coverage of the laws and ordinances relating to redevelopment, subdivision control, zoning, official mapping, and other topics including interpretation, philosophy, enabling legislation, and model ordinances. The legal basis of current and long-range planning policy will be discussed. *Prerequisite:* CRP 472.

CRP 483—Seminar on Planning Communication—3 cr. (3 and 0)
Informal means open for plan implementation. The organization of effective public information and education programs, use of citizens' advisory committees, and application of other implementation techniques. Lectures, student reports, selected readings, and visiting speakers.

CRP 611—Introduction to City and Regional Planning—3 cr. (3 and 0)

CRP 612—City and Regional Planning Theory—3 cr. (3 and 0)

CRP 621—Urban Social Structure—3 cr. (3 and 0)

CRP 641—History of Planning—3 cr. (3 and 0)

CRP 672—Planning Administration and Practice—3 cr. (3 and 0)

CRP 673—Government and Planning Law—3 cr. (3 and 0)

CRP 683—Seminar on Planning Communication—2 cr. (2 and 0)

CRP 822—Urban Systems—3 cr. (3 and 0)

CRP 831—Economics of Land Use Planning—3 cr. (3 and 0)

CRP 853—Introduction to Planning Studio—3 cr. (3 and 0)

CRP 854—Planning Studio II—3 cr. (0 and 9)

CRP 863—Planning Studio III—3 cr. (0 and 9)

CRP 864—Planning Thesis—6 cr. (0 and 18)

CRP 881—Seminar in Quantitative Methods I—3 cr. (3 and 0)

CRP 882—Seminar in Quantitative Methods II—3 cr. (3 and 0)

CRP 884—Public Facility Planning—3 cr. (3 and 0)

CRP 893—City and Regional Planning Internship—3 cr. (0 and 0)

CRP 894—City and Regional Planning Internship—3 cr. (0 and 0)

CIVIL ENGINEERING

Associate Professors: W. Baron, H. W. Busching, *Head;* J. E. Clark, R. E. Elling, J. C. McCormac, J. P. Rostron, A. E. Schwartz, D. B. Stafford

Assistant Professors: Nuri Akkas, B. L. Edge, J. S. Love, Jr., F. L. Roberts

Instructor: K. G. Bhatia

CE 201—Surveying—3 cr. (2 and 3)

Elementary plane surveying for other than Civil Engineering students. Coverage includes measurement of distance, leveling, horizontal and vertical angles, stadia and topography, area and volume calculations, construction surveying. Field exercises provide practice in the use of surveying instruments. *Prerequisite:* Math 106.

CE 205—Civil Engineering Methodology—2 cr. (1 and 3)

Concepts of civil engineering analysis and design, case histories and project studies, introduction to theory and practice of plane surveying, measurements and errors, differential leveling, and topographic mapping. Laboratory includes typical design and construction problems. *Prerequisite:* Math 106.

CE 206—Geometrics—2 cr. (1 and 3)

Application of geometrics to civil engineering problems, computations and triangulation, coordinate systems, electronic methods of measuring distances, photogrammetry, introduction to digital computation and elementary programming. *Prerequisite:* CE 205.

CE 301—Introduction to Structural Science—3 cr. (2 and 2)

Analysis of statically determinate and indeterminate structural elements and systems. Influence lines for beams and trusses, calculation of rotations and deflections by integration, moment area, conjugate beam and unit load methods. Indeterminate analysis by force and displacement methods and moment distribution. *Prerequisite:* EM 304, CE 206.

CE 302—Structural Design I—3 cr. (2 and 2)

Design and detail of components and connections for timber and metal structures. *Prerequisite:* CE 301.

CE 310—Transportation Engineering—4 cr. (3 and 2)

Planning, location, design, operation, and administration of highways, railroads, airports and other transportation facilities, including economic considerations, pavement design, and digital computer applications to geometric and earthwork computation. *Prerequisite:* CE 206; *corequisite:* CE 331.

CE 320—CONCRETE AND BITUMINOUS MATERIALS—2 cr. (1 and 3)
Investigation and selection of aggregates for portland cement concrete and asphaltic concrete; latest methods of design of portland cement mixes and asphaltic concrete mixes; field control and adjustments; field trips to nearby construction jobs. *Prerequisite:* EM 304 and Junior standing.

CE 330—SOIL MECHANICS—3 cr. (2 and 2)
Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength, consolidation, stress distribution and bearing capacity of soils. *Prerequisite:* EM 304 and Junior standing.

CE 360—CIVIL ENGINEERING SYSTEMS ANALYSIS—3 cr. (2 and 3)
Development of mathematical models for complex civil engineering systems. Digital and analog computer solution techniques. Application to large-scale systems in all phases of civil engineering. Introduction to CSMP and ICES. *Prerequisite:* Math 208 and permission of instructor.

CE 402—STRUCTURAL DESIGN II—3 cr. (2 and 2)
Design and detail of reinforced concrete members using elastic and ultimate strength theories, introduction to prestressed concrete. *Prerequisite:* CE 301, 320.

CE 410—TRAFFIC ENGINEERING: OPERATIONS—3 cr. (3 and 0)
Basic characteristics of motor-vehicle traffic; techniques for making traffic engineering investigations; design and application of traffic control devices; traffic design of parking facilities; traffic laws and ordinances; public relations. *Prerequisite:* CE 310.

CE 412—URBAN TRANSPORTATION PLANNING—3 cr. (3 and 0) F
Urban travel characteristics; characteristics of transportation systems; transportation and land-use studies; trip distribution and trip assignment models; city patterns and subdivision layout. *Prerequisite:* CE 310.

CE 415—SEMINAR IN TRAFFIC ENGINEERING—1 cr. (0 and 2)
Discussion, readings, and practical applications of the operational methods of traffic engineering and consideration of the problems confronting the city, county, and state traffic engineer.

CE 417—AIRPHOTO INTERPRETATION I—3 cr. (2 and 3)
A brief review of the basic geometry of aerial photographs, characteristics of geologic and topographic features identifiable from aerial photographs, and site characteristics related to soil profile. Laboratory work includes soil mapping, selection of construction sites, and location of soil deposits for engineering purposes. *Prerequisite:* Junior standing and/or permission of instructor.

CE 419—GENERAL PHOTOGRAMMETRY—3 cr. (2 and 3) S
Fundamentals of mapping by the use of aerial photographs; characteristics, production and use of aerial photographs; study of the operation of popular photogrammetric instruments including aerial cameras, stereoscopic viewing and plotting equipment; practice in the use of stereocomparagraph and multiplex plotting instruments; scale, tilt, and coordinate calculations; construction of photomosaics. *Prerequisite:* Math 108 and Junior standing.

CE 420—MECHANICAL PROPERTIES OF MATERIALS—3 cr. (3 and 0)
The course provides a comprehensive introduction to the analysis of mechanical response of materials. Emphasis is placed on the behavior of solid materials that are used in civil engineering structures but are not considered in depth in other undergraduate courses. Plastics, fibers, and composite materials are studied. Students are assisted in investigating a realistic problem in materials technology. *Prerequisite:* Permission of instructor.

CE 424—CONSTRUCTION METHODS—2 cr. (2 and 0)
A survey of the principal methods and equipment used in the construction industry. Critical path scheduling and short reports are required. *Prerequisite:* Senior standing.

CE 425—ENGINEERING RELATIONS—3 cr. (3 and 0)
Business, legal, and ethical relations in engineering practice. *Prerequisite:* Senior standing.

CE 431—APPLIED SOIL MECHANICS—3 cr. (2 and 2)
Relationship of local geology to soil formations, ground water, planning of site investigation, sampling procedures, laboratory determination of design parameter, foundation design, and settlement analysis. *Prerequisite:* CE 330.

CE 434—CONSTRUCTION COSTS AND ESTIMATES—3 cr. (2 and 2)
Interpretation of specifications and plan reading necessary for the proper estimation of quantities of materials and costs of engineering structures. The course is presented from both the designer's and the constructor's viewpoint in order to fit the young engineer with the essential details an inspector or a construction engineer should have at his command. *Prerequisite:* Senior standing.

CE 435—ENGINEERING PROJECT ANALYSIS—3 cr. (2 and 2)
Advanced analysis of engineering projects. Theory of economic, financial and intangible analysis of large-scale construction projects. Practical exercises in cost-benefit studies and construction decisions. *Prerequisite:* Permission of instructor.

CE 453—ADVANCED STRUCTURAL ANALYSIS—3 cr. (3 and 0)
Slopes and deflections of beams and trusses by energy methods. Analysis of statically indeterminate structures and construction of influence lines by virtual-work method. Application of moment distribution and slope deflection methods. *Prerequisite:* CE 301.

CE 462—PORT AND HARBOR ENGINEERING—3 cr. (3 and 0)
A unified treatment of the basic principles used in the design, construction, and operation of ports and harbors. Emphasis is placed on the philosophy behind port layout and the optimal site and size selections, as well as optimal port operations. The basic principles and economic factors in small craft harbor design are studied. The requirements for harbor maintenance and the design of harbor protection structures are presented. This integrated treatment covers in varying degrees the application of soil, structure, and fluid mechanics as well as some economic optimizing criteria.

CE 490—SPECIAL PROJECTS—1-3 cr. (1-3 and 0)
Studies or laboratory investigations on special topics in the Civil Engineering field which are of interest to individual students and staff members. Arranged

on a project basis with a maximum of individual student effort and a minimum of staff guidance. *Prerequisite:* Senior standing.

CE H490—SPECIAL PROJECTS—1-3 cr. (1-3 and 0)
Honors section of CE 490; admission by invitation.

(Noncivil engineering students only.)

CE 610—TRAFFIC ENGINEERING: OPERATIONS—3 cr. (3 and 0)

CE 612—URBAN TRANSPORTATION PLANNING—3 cr. (3 and 0)

CE 615—SEMINAR IN TRAFFIC ENGINEERING—1 cr. (0 and 2)

CE 617—AIRPHOTO INTERPRETATION I—3 cr. (2 and 3)

CE 619—GENERAL PHOTOGRAMMETRY—3 cr. (2 and 3)

CE 620—MECHANICAL PROPERTIES OF MATERIALS—3 cr. (3 and 0)

CE 634—CONSTRUCTION COSTS AND ESTIMATES—3 cr. (2 and 3)

CE 635—ENGINEERING PROJECT ANALYSIS—3 cr. (2 and 2)

CE 653—ADVANCED STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 662—PORT AND HARBOR ENGINEERING—3 cr. (3 and 0)

CE 801—STRUCTURAL ENGINEERING I—3 cr. (3 and 0)

CE 802—PRESTRESSED CONCRETE ANALYSIS AND DESIGN—3 cr. (3 and 0)

CE 803—REINFORCED CONCRETE STRUCTURAL SYSTEMS—3 cr. (3 and 0)

CE 804—THEORY AND DESIGN OF THIN PLATES—3 cr. (3 and 0)

CE 805—PLASTIC DESIGN OF STEEL STRUCTURES—3 cr. (3 and 0)

CE 806—DESIGN OF STEEL MEMBERS—3 cr. (3 and 0)

CE 807—NUMERICAL AND APPROXIMATE METHODS OF STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 808—FINITE ELEMENT METHODS IN STRUCTURAL ANALYSIS—3 cr. (3 and 0)

CE 811—HIGHWAY GEOMETRIC DESIGN—3 cr. (2 and 3)

CE 812—AIRPHOTO INTERPRETATION II—3 cr. (2 and 3)

CE 813—HIGHWAY AND AIRPORT PAVEMENT DESIGN—3 cr. (3 and 0)

CE 814—TRAFFIC FLOW THEORY—3 cr. (3 and 0)

CE 815—HIGHWAY SAFETY ENGINEERING—3 cr. (3 and 0)

CE 816—HIGHWAY PLANNING—3 cr. (3 and 0)

CE 818—AIRPORT PLANNING AND DESIGN—3 cr. (3 and 0)

CE 819—TRANSPORTATION RESEARCH—2-4 cr.

CE 820—CEMENT AND CONCRETE—3 cr. (2 and 3)

CE 821—BITUMINOUS PAVING MATERIALS—3 cr. (2 and 3)

CE 822—AGGREGATES AS CONSTRUCTION MATERIALS—3 cr. (2 and 3)

CE 823—INELASTIC BEHAVIOR OF ENGINEERING MATERIALS—3 cr. (3 and 0)

CE 825—DISTRIBUTION AND PROPERTIES OF SOILS—3 cr. (3 and 0)

CE 831—FOUNDATION ENGINEERING—3 cr. (2 and 3)

CE 832—ADVANCED SOIL MECHANICS—3 cr. (3 and 0)

CE 833—PHYSICAL AND PHYSIO-CHEMICAL PROPERTIES OF SOILS—3 cr. (2 and 3)

CE 835—DESIGN OF EARTH STRUCTURES—3 cr. (3 and 0)

CE 889—SPECIAL PROBLEMS I—1-3 cr.

CE 890—SPECIAL PROBLEMS II—1-3 cr.

CE 891—RESEARCH—3 cr.

CE 901—THEORY AND DESIGN OF SHELLS—3 cr. (3 and 0)

CE 902—STRUCTURAL VIBRATIONS—3 cr. (3 and 0)

CE 991—DOCTORAL RESEARCH—Credit to be arranged.

COMPUTER SCIENCE

(Department of Mathematical Sciences)

Professors: R. E. HAYMOND, A. T. HIND, JR., J. W. KENELLY

Associate Professors: A. S. COVER, C. E. KIRKWOOD, JR., M. C. PALMER

Assistant Professors: W. R. BOLAND, J. C. PECK, J. A. ZIMMER

Instructor: EUGENIE V. BARTMESS

COMP SC 205—ELEMENTARY COMPUTER PROGRAMMING—3 cr. (3 and 0)
A detailed study of an algebraic computer programming language and its use in solving problems. The language will be selected as appropriate to the computer presently available.

COMP SC 206—ADVANCED PROGRAMMING IN FORTRAN—3 cr. (3 and 0)
A continuing study of computer programming with the Fortran language. Emphasis on subroutine computation with application to problems in science and engineering. *Prerequisite:* Comp Sc 205.

COMP SC 207—ADVANCED PROGRAMMING IN PL/1—3 cr. (3 and 0)
A programming course utilizing the advanced features of the PL/1 language. Topics include dynamic storage allocation, string manipulation, compile-time facilities, error handling, and list processing. *Prerequisite:* Comp Sc 205.

COMP SC 210—ALGORITHMIC PROCESSES FOR ENGINEERS—3 cr. (3 and 0)
Concept and properties of an algorithm, language and notations for describing algorithms, analysis of computational problems, development of algorithms, and applications to include polynomial interpolation, zeros of equations, systems of equations, matrix manipulations, and solution of differential equations.

COMP SC 308—DATA PROCESSING FOR BUSINESS APPLICATIONS—3 cr. (3 and 0)
An introduction to the Cobol language with application to business data processing. Emphasis is placed on the organization and processing of data files. *Prerequisite:* Comp Sc 205.

COMP SC 409—INTRODUCTION TO NUMERICAL ANALYSIS I—3 cr. (3 and 0)
An introduction to the problems of classical numerical analysis emphasizing computational procedures and application. Topics include: polynomial interpolation, matrix methods, systems of linear equations, nonlinear equations,

numerical solution of ordinary differential equations. *Prerequisite:* Comp Sc 205, E&CE 299, Math 208.

COMP SC 410—INTRODUCTION TO NUMERICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Comp Sc 409. Ordinary differential equations boundary value problems, functional approximation, numerical solution of partial differential equations.

COMP SC 421—INTRODUCTION TO ASSEMBLER LANGUAGE PROGRAMMING—3 cr. (3 and 0)
Computer structure, machine language, assembler language, subroutine linkage, input and output through the operating system, macro definition and conditional assembly. *Prerequisite:* Comp Sc 205.

COMP SC 422—ADVANCED ASSEMBLER LANGUAGE PROGRAMMING—3 cr. (3 and 0)
A treatment of computer operating systems with special attention being given to IBM systems. This includes a comprehensive study of macro development, job control language, data management, linkage editor, utilities, advanced assembler language and debugging techniques. *Prerequisite:* Comp Sc 421.

COMP SC 423—FUNDAMENTALS OF SOFTWARE DESIGN—3 cr. (3 and 0)
A detailed study of computer organization in terms of both hardware and software. Topics include interrupt systems, primitive level input/output, job control, advanced data management techniques, linkage editor and utility systems, fundamentals of communications systems. In the early part of the course considerable emphasis is placed on a study of the IBM 360 while in the latter part a variety of other manufacturers' equipment is described. *Prerequisite:* Comp Sc 205.

COMP SC 428—ALGORITHMIC LANGUAGES AND COMPILERS—3 cr. (3 and 0)
Formed description of algorithmic languages and the techniques used in their compilation, study of syntax, semantics, procedures, replication, iteration, and recursion in these languages, including comparisons of commonly used languages. *Prerequisite:* Comp Sc 205, Math 295 or equivalent.

COMP SC 609—INTRODUCTION TO NUMERICAL ANALYSIS I—3 cr. (3 and 0)

COMP SC 610—INTRODUCTION TO NUMERICAL ANALYSIS II—3 cr. (3 and 0)

COMP SC 621—INTRODUCTION TO ASSEMBLER LANGUAGE PROGRAMMING—3 cr. (3 and 0)

COMP SC 622—ADVANCED ASSEMBLER LANGUAGE PROGRAMMING—3 cr. (3 and 0)

COMP SC 623—FUNDAMENTALS OF SOFTWARE DESIGN—3 cr. (3 and 0)

COMP SC 628—ALGORITHMIC LANGUAGES AND COMPILERS—3 cr. (3 and 0)

Note: The following courses are computer related and of interest to computer scientists: Math 428, 429, 452, 628, 629, 652, 861, 862, 863, 864, 987.

DAIRY SCIENCE

Professors: R. W. HENNINGSON, V. HURST, J. J. JANZEN, W. A. KING, *Head;* J. T. LAZAR, JR.

Associate Professors: C. C. BRANNON, J. F. DICKEY, G. D. O'DELL

DY SC 201—INTRODUCTION TO DAIRY SCIENCE—3 cr. (2 and 3) F
A fundamental course designed to give the student a working knowledge of Dairy Science. Studies include history of dairying, dairy breeds and cattle evaluation, nutrition, physiology, housing, quality milk production, quality control and the evaluation of milk and its products, the manufacture of milk products and their value in the human food supply.

DY SC 306—THE CHEMICAL AND PHYSICAL NATURE OF MILK—3 cr. (2 and 3) S

The nature and properties of the major and minor constituents of milk, the effect of chemical and physical treatment on milk constituents, and analytical methods necessary to determine the composition and properties of milk and its constituents. The philosophy and development of quality control.

DY SC 307—MARKET MILK—3 cr. (2 and 3) F, '72 and alternate years.
Composition, procurement, processing, distribution, quality control, public health aspects, basic chemistry and bacteriology of industrial milk supplies and cultured products.

DY SC 310—DAIRY CATTLE SELECTION—1 cr. (0 and 3)
F, '72 and alternate years.
Emphasis is placed upon the selection of dairy cattle for profitable herd operations. Evaluations of herd classifications, fitting, showing, and true type are made.

DY SC 402—DAIRY MANUFACTURES—4 cr. (3 and 3)
S, '74 and alternate years.
The principles and practice of the manufacture of ice cream and related dairy products, the principles of the manufacturer of condensed and evaporated milks and milk powders, and the physical, chemical and biological factors involved.

DY SC 404—PLANT MANAGEMENT—3 cr. (2 and 3)
S, '73 and alternate years.
The organization and operation of dairy and food plants and the coordination of all functions into an orderly business enterprise. Emphasis will be given to management's responsibility concerning the procurement, processing, quality control and distribution of food products. Business and industrial techniques are used to develop maximum efficiencies.

DY SC 409—DAIRY SCIENCE SEMINAR—2 cr. (2 and 0)
F, '73 and alternate years.
Special research problems in production and manufactures are studied. Individual topics not fully covered in classwork are assigned for special report before class and members of Dairy Science Staff.

DY SC 410—DAIRY SCIENCE SEMINAR—2 cr. (2 and 0)
S, '74 and alternate years.
A continuation of Dy Sc 409 with emphasis on current research literature and research methods.

Dy Sc 452—Dairy Cattle Feeding and Management—3 cr. (2 and 3) S, '73 and alternate years.

Fundamental principles in the care, feeding, and management of dairy cattle of all ages. Topics include general consideration in selecting a breed and the individual cow, calf raising, growth and development of dairy heifers, care and management of the milking herd and feeding for milk production.

Dy Sc 453—Animal Reproduction—3 cr. (3 and 0) F

Reproductive physiology and endocrinology of mammals with emphasis on farm animals and frequent reference to reproduction in laboratory animals and humans.

Dy Sc 455—Animal Reproduction Laboratory—1 cr. (0 and 3) F

This course will supplement Dy Sc 453. Practical work will include comparative anatomy and histology of the male and female reproductive organs; semen collection, evaluation and processing; techniques of artificial insemmination, sexual behavior and the principles of pregnancy tests for humans. *Prerequisite:* To be taken concurrently or to follow Dy Sc 453.

Dy Sc 602—Dairy Manufactures—4 cr. (3 and 3)

Dy Sc 604—Plant Management—3 cr. (2 and 3)

Dy Sc 606—Chemical and Physical Nature of Milk—3 cr. (2 and 3)

Dy Sc 607—Market Milk—3 cr. (2 and 3)

Dy Sc 652—Dairy Cattle Feeding and Management—3 cr. (2 and 3)

Dy Sc 653—Animal Reproduction—3 cr. (3 and 0)

Dy Sc 655—Animal Reproduction Laboratory—1 cr. (0 and 3)

Dy Sc 801—Topical Problems—1-3 cr.

Dy Sc 802—Genetics of Dairy Cattle Improvement—3 cr. (3 and 0)

Dy Sc 803—Physiology of Reproduction and Milk Secretion—3 cr. (3 and 0)

Dy Sc 805—Newer Knowledge of Dairy Nutrition—3 cr. (3 and 0)

Dy Sc 807—Fermented Dairy Products—3 cr. (2 and 3)

Dy Sc 808—Industrial Dairy Science—3 cr. (3 and 0)

Dy Sc 891—Research—Credit to be arranged.

ECONOMICS

Professors: H. H. Macaulay, Jr., W. C. Whitten, Jr.

Associate Professor: B. R. Skelton

Assistant Professors: F. A. Close, *Head;* R. F. Hebert, F. H. Rueter, R. D. Shannon, H. H. Ulbrich,* T. B. Yandle, Jr., J. A. Ziegler, P. M. Zipin

Instructors: L. E. Nordquist, W. D. Plylar, A. Velez, A. G. Wise

Econ 200—Economic Concepts—3 cr. (3 and 0)

A comprehensive course including both micro and macro economic concepts for the student not having theoretical course requirements beyond the principles level or for the student expecting to take a selected group of the 300 level courses in economics.

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* Part-time.

Econ 201—Principles of Economics—3 cr. (3 and 0)
The fundamental principles of pricing, stablization and growth in a modern economy. Topics include supply and demand, employment theory and fiscal policy, the banking system and monetary policy, and the economics of growth.

Econ H201—Principles of Economics—3 cr. (3 and 0)
An enrichment of the subject matter of Econ 201 through assigned readings and individualized instruction; admission by invitation.

Econ 202—Principles of Economics—3 cr. (3 and 0)
Continuation of Econ 201 with an intensive study of the economics of the firm, the pricing of resources, and international economic relations. The theory is given relevance through the analysis of current economic problems. *Prerequisite:* Econ 201.

Econ H202—Principles of Economics—3 cr. (3 and 0)
An enrichment of the subject matter of Econ 202 through assigned readings and individualized instruction; admission by invitation. *Prerequisite:* Econ 201 or H201.

Econ 301—Economics of Labor—3 cr. (3 and 0)
The economics of the labor market, the problems of the industrial worker, and the methods of adjusting labor-management disputes. *Prerequisite:* Econ 200 or 201.

Econ 302—Money and Banking—3 cr. (3 and 0)
Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. *Prerequisite:* Econ 200 or 201, 202.

Econ 305—Investment Analysis—3 cr. (3 and 0)
A study of techniques useful in analyzing alternative investment opportunities, with emphasis on corporate securities. Investment planning and portfolio management are considered. *Prerequisite:* Econ 200 or 201.

Econ 306—Risk and Insurance—3 cr. (3 and 0)
Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints by considering insurance carriers, contracts, underwriting and regulation. *Prerequisite:* Econ 200 or 201.

Econ 308—Collective Bargaining—3 cr. (3 and 0)
The practices, procedures, legal foundations, and legal structure associated with collective bargaining. The form and content of the labor contract, the grievance machinery, and the mediation and arbitration institutions will also be studied. *Prerequisite:* Econ 200 or 201.

Econ 309—Government and Business—3 cr. (3 and 0)
The relationships between government and business, including among other topics, governmental efforts to enforce competition, to regulate public utilities, and to protect the special interests of laborers, farmers, and consumers. *Prerequisite:* Econ 200 or 201.

ECON 314—INTERMEDIATE ECONOMIC THEORY—3 cr. (3 and 0)
An analytical study of the basic concepts of value and distribution under alternative market conditions. *Prerequisite:* Econ 201, 202.

ECON 350T—ECONOMICS OF THE CONSUMER AND THE FIRM IN A MARKET SYSTEM—3 cr. (3 and 0)
Scarce resources impose the necessity of choice on society; the rationale of the market system in the allocation of these scarce resources, basic market theory and its application to contemporary economic problems in American society; the solutions of a nonmarket system will be contrasted. Open only to public school teachers of social studies.

ECON 351T—ECONOMICS OF EMPLOYMENT, THE PRICE LEVEL, AND GROWTH—3 cr. (3 and 0)
National income accounting concepts will be studied; also money and banking, monetary policy, fiscal policy, and an analysis of their relationship to national income, employment, the price level, and economic growth. Open only to public school teachers of social studies.

ECON 403—DEVELOPMENT OF ECONOMIC THOUGHT—3 cr. (3 and 0)
A study of the origin and evolution of ideas with some emphasis on the historical context, the problems which inspired these ideas, and the nature of the solutions which they provided: from ancient days to the present. *Prerequisite:* Econ 200 or 201, 202.

ECON 404—COMPARATIVE ECONOMIC SYSTEMS—3 cr. (3 and 0)
A comparative analytical and historical study of the principal economic systems which have been important in the modern world including among others, captialism and socialism. *Prerequisite:* Econ 200 or 201, 202.

ECON 407—NATIONAL INCOME AND EMPLOYMENT ANALYSIS—3 cr. (3 and 0)
An intensive study of selected economic theories with special emphasis on income and employment. Part of the course is devoted to the analysis of national income accounts and income. *Prerequisite:* Econ 200 or 201, 202.

ECON 409—THE ECONOMICS OF INCOME DISTRIBUTION—3 cr. (3 and 0)
Examines the extent and causes of poverty, the effects of discrimination on income inequality, and studies the various public policy remedies and their economic consequences.

ECON 410—ECONOMIC DEVELOPMENT—3 cr. (3 and 0)
Consideration and analysis of economic and related problems of the underdeveloped countries. Attention will be given to national and international programs designed to accelerate solution of these problems. *Prerequisite:* Econ 200 or 201, 202.

ECON 412—INTERNATIONAL TRADE—3 cr. (3 and 0)
A study of economic principles particularly applicable to trade between nations. Topics covered include the balance of payments, determination of foreign exchange rates, price and income effects on the composition and level of trade, and commercial policy. *Prerequisite:* Econ 314.

ECON 413—INTERNATIONAL FINANCE—3 cr. (3 and 0)
With primary emphasis upon international monetary relations, the course surveys history and theory. Topics covered include exchange-rate determi-

nation, exchange-stability conditions, the purchasing-power-parity doctrine, the effects of devaluation and exchanging speculation. (Not open to students who have taken Econ 412.) *Prerequisite:* Econ 302.

ECON 414—THE ECONOMICS OF INTERNATIONAL COMPETITION—3 cr. (3 and 0)

Analyzes the structural and institutional frameworks under which international competition occurs with emphasis on the comparative economic effects of alternative frameworks on comparative advantage and economic growth.

ECON 416—DEVELOPMENT OF THE MODERN ECONOMY—3 cr. (3 and 0)

An analysis of the historical forces and influences which have contributed to the emergence and development of the modern economy. *Prerequisite:* Econ 200 or 201, 202.

ECON 419—ECONOMICS OF DEFENSE—3 cr. (3 and 0)

Examines the American defense establishment in terms of resources utilized, the alternative uses of these resources and the contribution to the national economy and scientific progress that is generated by these resources in a defense use. Particular attention is given to economic problems inherent in shifting resources from non-defense to defense uses and vice versa as well as among alternative defense uses. *Prerequisite:* Acct 201, Econ 200 or 201.

ECON 420—ECONOMICS OF TAXATION—3 cr. (3 and 0)

An intensive study of a limited number of problems in taxation with particular emphasis on the economic effects that cause and result from certain taxes. Topics include averaging, incentives to work, incidence, concepts of equity, excess burden, definitions of income, depletion, and capital gains. *Prerequisite:* Econ 314.

ECON 421—URBAN ECONOMICS—3 cr. (3 and 0)

Economic problems associated with the concentration of population in central places are examined. The historical development of cities and the associated economic implications for individuals, firms, and society are studied. Legislation of economic importance to urban living is analyzed. *Prerequisite:* Econ 200 or 201, 202.

ECON 422—MONETARY THEORY AND POLICY—3 cr. (3 and 0)

An intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. *Prerequisite:* Econ 302 or permission of instructor.

ECON 423—ECONOMICS OF HOUSING—3 cr. (3 and 0)

A study of the economics of the provision for housing in a growing society. The problem will be examined within the context of economic theory. Empirical evidence will be evaluated; current national, regional, and local situations will be examined. Public policy on housing and various alternative solutions to the problem will be studied.

ECON 424—THE ORGANIZATION OF INDUSTRIES—3 cr. (3 and 0)

Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output and other policies of the firm; antitrust and other public policies and problems will be studied. *Prerequisite:* Econ 314.

Econ 603—Development of Economic Thought—3 cr. (3 and 0)

Econ 604—Comparative Economic Systems—3 cr. (3 and 0)

Econ 607—National Income and Employment Analysis—3 cr. (3 and 0)

Econ 610—Economic Development—3 cr. (3 and 0)

Econ 612—International Trade—3 cr. (3 and 0)

Econ 613—International Finance—3 cr. (3 and 0)

Econ 616—Development of the Modern Economy—3 cr. (3 and 0)

Econ 619—Economics of Defense—3 cr. (3 and 0)

Econ 620—Economics of Taxation—3 cr. (3 and 0)

Econ 621—Urban Economics—3 cr. (3 and 0)

Econ 622—Monetary Theory and Policy—3 cr. (3 and 0)

Econ 623—Economics of Housing—3 cr. (3 and 0)

Econ 624—The Organization of Industries—3 cr. (3 and 0)

Econ 650T—Economics of the Consumer and the Firm in a Market System—3 cr. (3 and 0)

Econ 651T—Economics of Employment, the Price Level, and Growth—3 cr. (3 and 0)

Econ 800—Advanced Economic Analysis—3 cr. (3 and 0)

Econ 802—Advanced Economic Concepts and Applications I—3 cr. (3 and 0)

Econ 803—Advanced Economic Concepts and Applications II—3 cr. (3 and 0)

Econ 810—Seminar in Economic Methodology—3 cr. (3 and 0)

Econ 811—Seminar in Labor Economics—3 cr. (3 and 0)

Econ 812—Seminar in the Development of Economic Thought—3 cr. (3 and 0)

Econ 813—Seminar in Community Goods and Environmental Quality—3 cr. (3 and 0)

Econ 814—Welfare Economics—3 cr. (3 and 0)

Econ 820—Seminar in the Economics of Taxation—3 cr. (3 and 0)

Econ 821—Economic Theory I—3 cr. (3 and 0)

Econ 822—Economic Theory II—3 cr. (3 and 0)

Econ 831—Seminar in Urban Development Economics—3 cr. (3 and 0)

Econ 891—Research—Credit to be arranged.

Econ 900—Seminar in Advanced Economic Theory—3 cr. (3 and 0)

EDUCATION

Professors: C. R. Freeze, M. A. King, *Head;* H. F. Landrith, M. A. Packer

Associate Professors: G. W. Gray, J. A. Hash, J. E. Matthews, W. W. Pennscott

Assistant Professors: I. Carolyn Briscoe, S. L. Buckner, Elizabeth B. Galloway, J. R. Harris, E. F. Olive, T. H. Parry

Instructors: J. H. Adair, Teryle W. Carpenter, Sharon G. West

Ed 011—Basic Reading—5 cr. (5 and 0)

Designed for students who have not acquired adequate reading skills as demonstrated by scores on entrance examinations or diagnostic tests. Study skills, vocabulary, content reading and diagnosis of students' problems, including counseling for vocational and academic potential. Course meets five hours per week.

Ed 013—Basic Reading—5 cr. (5 and 0)

A continuation of Ed 011. Designed for students who have not acquired adequate reading skills as demonstrated by scores on entrance examinations or diagnostic tests. Study habits, vocabulary, content reading and diagnosis of students' problems including counseling for vocational and academic potential. Course meets five hours per week.

Ed 100—Orientation—1 cr. (1 and 0)

Lectures and discussions on teaching in addition to serving as teacher aides. Required of all students in Early Childhood Education, Elementary Education, Secondary Education, and Science Teaching.

Ed 101—Reading Improvement—1 cr. (0 and 2)

Developmental reading for University students who desire to improve reading skills; open to any University student, but priority given to referrals.

Ed 102—Efficient Reading—1 cr. (0 and 3)

Specific goals are to increase reading rate and flexibility of reading rate with a satisfactory level at comprehension, and to broaden general and technical vocabulary. Individual diagnosis provides an individual program developed under the direction of the reading instructor.

Ed 301—History of American Education—3 cr. (3 and 0)

Development of educational systems, theories and practices against a background of American social and intellectual history. *Prerequisite:* Junior standing or permission of instructor.

Ed H301—History of American Education—3 cr. (3 and 0)

Honors section of Ed 301; admission by invitation.

Ed 302—Educational Psychology—3 cr. (3 and 0)

The nature, capacities, equipment, growth, and development of the learner.

Ed H302—Educational Psychology—3 cr. (3 and 0)

Honors section of Ed 302; admission by invitation.

Ed 334—Child Growth and Development—3 cr. (3 and 0)

A study of the physical and emotional growth and development of the child. *Prerequisite:* Ed 302 or Psych 201.

Ed 335—Adolescent Growth and Development—3 cr. (3 and 0)
The physical and emotional growth and development of the adolescent. *Prerequisite:* Ed 302 or Psych 201.

Ed H335—Adolescent Growth and Development—3 cr. (3 and 0)
Honors section of Ed 335; admission by invitation.

Ed 336—Behavior of the Preschool Child—3 cr. (2 and 2)
A study of behavior of the preschool child, including observation and participation. *Prerequisite:* Ed 302 or Psych 201.

Ed 401—The Community College—3 cr. (3 and 0)
History and philosophy of the junior college, its functions, organization and administration.

Ed 405—Principles of Guidance—3 cr. (3 and 0)
Principles, procedures, and policies of the guidance services. For all personnel workers. *Prerequisite:* 6 semester hours in education or psychology.

Ed 406—History and Philosophy of Education—3 cr. (3 and 0)
An analysis of the development of modern education practices and philosophies with emphasis upon the historical and philosophical development in the United States.

Ed 412—Directed Teaching in Secondary School Subjects—6 cr. (1 and 15)
A program of supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for prospective teachers to obtain experiences in the subject area. Students to be sectioned according to teaching fields: English, History and Social Sciences, Mathematics, Modern Languages, Science. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio necessary for graduation.)

Ed 424—Methods and Materials in Secondary School Instruction—3 cr. (3 and 0)
Development of instructional practices and materials appropriate for the secondary school; familiarization with curriculum materials. Students to be sectioned according to teaching area: English, History and Social Science, Mathematics, Modern Languages, Science.

Ed 428—The Systems Approach to Education—3 cr. (2 and 3)
The course will include the development of task analysis techniques, development and use of behavioral objectives, writing of the curriculum and incorporation of the various types of media into a systematic instructional program. *Prerequisite:* Ed 497 or consent of instructor.

Ed 431—Special Institute Course: Early Childhood Education—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 432—Special Institute Course: Elementary School—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 433—Special Institute Course: Secondary School—3 cr. (3 and 0)
Subject areas organized according to Institute needs.

Ed 434—Special Institute Course: Current Problems in Education—3 cr. (3 and 0)

Subject areas organized according to Institute needs.

Ed 435—Special Institute Course: Curriculum—3 cr. (3 and 0)

Subject areas organized according to Institute needs.

Ed 436—Special Institute Course: Supervision and Administration—3 cr. (3 and 0)

Subject areas organized according to Institute needs.

Ed 458—Health Education—3 cr. (3 and 0)

A study of the information needed for effective cooperation with parents, physicians and public health agencies in the promotion and improvement of community health, including problems of personal hygiene, health records, immunization, and control of communicable disease.

Ed 459—Fundamentals of Basic Reading—3 cr. (3 and 0)

Study of reading skills in relation to the psychological bases; developmental principles; historical and current issues in reading practices.

Ed 460—Curriculum Development in the Elementary School—3 cr. (3 and 0)

An analysis and evaluation of newer practices in curriculum planning in the elementary school.

Ed 461—Teaching Reading in the Elementary School—3 cr. (3 and 0)

Study of the various phases of reading and their relation to the elementary program. Emphasis on modern practices in the classroom teaching of reading.

Ed 462—Reading Diagnosis and Remediation—3 cr. (2 and 3)

A clinical course in diagnostic and remedial procedures in the teaching of reading. Practice in the use of diagnostic instruments, interpretation of results, and case studies, with recommended remediation. Laboratory hours to be arranged with each individual. *Prerequisite:* 3 semester hours in reading or permission of instructor.

Ed 465—Secondary School Curriculum—3 cr. (3 and 0)

A study of the principles, techniques, and trends in secondary school curriculum development and evaluation.

Ed 466—Curriculum for Early Childhood Education—3 cr. (3 and 0)

Critical study of early childhood curriculum for nursery schools, kindergarten and early elementary grades.

Ed 471—The Exceptional Child—3 cr. (3 and 0)

Survey of exceptionality including handicapped and gifted children; nature, cause, and treatment of difficulties; educational problems.

Ed 472—Psychology of Mental Retardation—3 cr. (3 and 0)

Psychological aspects of mental retardation; learning, motivation, and personality development.

Ed 473—Teaching the Mentally Retarded—3 cr. (3 and 0)

Study, selection, and preparation of curricular materials; methods of teaching retarded children within the preadolescent and adolescent range. *Prerequisite:* Ed 472 or equivalent.

Ed 481—Directed Teaching in the Elementary School—6 cr. (1 and 15)
Supervised observation and teaching experiences in cooperation with selected elementary schools. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

Ed 483—Methods and Materials for Early Childhood Education—3 cr. (3 and 0)
Study of methods and materials applicable to nursery schools, kindergarten, and early elementary grades.

Ed 484—Directed Teaching in Early Childhood Education—6 cr. (1 and 15)
Supervised observation and teaching experiences in cooperation with nursery, kindergartens, and early elementary schools. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

Ed 485—Methods and Curriculum in Elementary Mathematics and Science—3 cr. (3 and 0)
Develop understandings, skills, and attitudes in the elementary mathematics and science curriculum, with emphasis on strategies, techniques, and materials for teaching elementary mathematics and science.

Ed 486—Methods and Curriculum in Elementary Social Studies and Language Arts—3 cr. (3 and 0)
Study of the elementary program with emphasis upon social studies and language arts materials, curriculum, and methodology.

Ed 491—Descriptive Statistics—3 cr. (3 and 0)
Basic descriptive statistics and research methodology applicable to education, psychology, and other social sciences.

Ed 494—School and Community Relationships—3 cr. (3 and 0)
A study of the interdependence of the school and community, with emphasis on educational implications.

Ed 497—Audio-Visual Aids in Education—3 cr. (3 and 0)
The techniques and uses of audio-visual aids in improving teaching effectiveness.

Ed 498—Teaching Secondary School Reading—3 cr. (3 and 0)
Methods and materials of teaching basic and developmental reading skills; programming special services in reading instruction. Demonstrations of tests and devices.

Ed 601—The Community College—3 cr. (3 and 0)

Ed 605—Principles of Guidance—3 cr. (3 and 0)

Ed 606—History and Philosophy of Education—3 cr. (3 and 0)

Ed 628—The Systems Approach to Education—3 cr. (2 and 3)

Ed 631—Special Institute Course: Early Childhood Education—3 cr. (3 and 0)

Ed 632—Special Institute Course: Elementary School—3 cr. (3 and 0)

Ed 633—Special Institute Course: Secondary School—3 cr. (3 and 0)

Ed 634—Special Institute Course: Current Problems in Education—3 cr. (3 and 0)

Ed 635—Special Institute Course: Curriculum—3 cr. (3 and 0)

Ed 636—Special Institute Course: Supervision and Administration—3 cr. (3 and 0)

Ed 660—Curriculum Development in the Elementary School—3 cr. (3 and 0)

Ed 662—Reading Diagnosis and Remediation—3 cr. (2 and 3)

Ed 665—Secondary School Curriculum—3 cr. (3 and 0)

Ed 671—The Exceptional Child—3 cr. (3 and 0)

Ed 672—Psychology of Mental Retardation—3 cr. (3 and 0)

Ed 673—Teaching the Mentally Retarded—3 cr. (3 and 0)

Ed 694—School and Community Relationships—3 cr. (3 and 0)

Ed 697—Audio-Visual Aids in Education—3 cr. (3 and 0)

Ed 698—Teaching Secondary School Reading—3 cr. (3 and 0)

Ed 707—Readings in Education—3 cr. (3 and 0)

Ed 720—School Personnel Administration—3 cr. (3 and 0)

Ed 721—Legal Phases of School Administration—3 cr. (3 and 0)

Ed 722—Field Experiences in School Administration and Supervision—3 cr. (2 and 3)

Ed 801—Seminar in Human Growth and Development—3 cr. (3 and 0)

Ed 802—Human Development: Psychology of Learning—3 cr. (3 and 0)

Ed 803—Advanced Methods of Teaching in the Secondary School—3 cr. (3 and 0)

Ed 804—Advanced Methods of Teaching in the Elementary Grades—3 cr. (3 and 0)

Ed 808—Educational Tests and Measurements—3 cr. (3 and 0)

Ed 809—Analysis of the Individual—3 cr. (3 and 0)

Ed 810—Techniques of Counseling—3 cr. (3 and 0)

Ed 811—School Finance—3 cr. (3 and 0)

Ed 813—Educational and Vocational Informational Services and Placement—3 cr. (3 and 0)

Ed 814—Field Experiences in Elementary School Guidance—3 cr. (2 and 3)

Ed 815—Field Experiences in Secondary School Guidance—3 cr. (2 and 3)

Ed 816—Field Experiences in Personnel Services in Higher Education—3 cr. (2 and 3)

Ed 817—Clinical Studies in Counseling and Guidance—1-3 cr.

Ed 818—Field Problems in School Administration and Supervision of Instruction—3 cr. (2 and 3)

Ed 830—Techniques of Supervision—The Public Schools—3 cr. (3 and 0)

Ed 831—Evaluation of Secondary School Instruction—3 cr. (3 and 0)

Ed 832—Evaluation of Instruction in the Elementary Schools—3 cr. (3 and 0)

Ed 840—Research Utilization—3 cr. (3 and 0)

Ed 851—Organization and Administration of the Elementary Schools—3 cr. (3 and 0)

Ed 852—Organization and Administration of the Secondary School—3 cr. (3 and 0)

Ed 861—Organization and Supervision of Reading Programs—3 cr. (3 and 0)

Ed 862—Clinical Research in Reading—3 cr. (3 and 0)

Ed 863—Practicum in Reading—3 cr. (2 and 2)

Ed 871—Interpersonal and Group Relationships—3 cr. (3 and 0)

Ed 881—Individual Testing I—3 cr. (3 and 0)

Ed 882—Individual Testing II—3 cr. (3 and 0)

Ed 890—Introduction to Research in Education—3 cr. (3 and 0)

ELECTRICAL AND COMPUTER ENGINEERING

Professors: R. W. Gilchrist, J. W. Lathrop, J. T. Long, J. C. Martin, J. N. Thurston, L. C. Wilcox, *Acting Head*

Associate Professors: W. L. Ball, J. A. Chisman, T. L. Drake, L. T. Fitch, B. E. Gilliland, C. P. Goodin, R. N. Kersey, Jr., H. V. Poe, R. W. Snelsire, I. S. Tolins, M. L. Wolla, W. T. Zink

Assistant Professors: D. C. Amoss, J. N. Gowdy, H. J. Helgert, R. D. Stinaff
Instructors: J. R. Fraker, C. W. Malstrom

E&CE 298—Digital Computation: Systems and Programs—1 cr. (1 and 0) F, S

An introduction to digital computation and digital computer systems: Historical background; components of the computer system; information flow; storage; basic algorithms; flow charting; and introduction to instruction writing.

E&CE 299—Digital Computation—2 cr. (1 and 2) F, S

A programming course designed to prepare students for the efficient use of digital computers. Fortran and PL-1 languages are used. An ideal course for those desiring a short but comprehensive introduction to computing. *Prerequisite:* E&CE 298.

E&CE 307—BASIC ELECTRICAL ENGINEERING—3 cr. (3 and 0) F, S

A course designed for the student needing a general knowledge of the following topics: electric circuit theory, electronics, and energy conversion devices. *Prerequisite:* Math 206, Phys 221, 223.

E&CE 308—ELECTRONICS AND ELECTROMECHANICS—3 cr. (2 and 2) F, S

A study of electronic devices and systems, as well as magnetic circuits and energy conversion methods. A previous knowledge of basic circuit theories assumed. *Prerequisite:* E&CE 331.

E&CE 312—ELECTROMECHANICS—3 cr. (2 and 2) S

The principles of energy conversion are introduced with emphasis on electromagnetic and electromechanical devices. From these, the mathematical and equivalent circuit models are developed, considering nonlinear magnetic characteristics and linear approximation. These models facilitate representation of the devices in extended systems. In-laboratory studies are made on the characteristics of saturble reactors, magnetic amplifiers, loudspeakers, transformers, d-c motors and generators, and a-c motors and generators. These characteristics are compared with those of the mathematical models. *Prerequisite:* E&CE 330, 331, 340.

E&CE 315—INFORMATION THEORY—3 cr. (3 and 0) S

A course designed for those interested in developing a precise definition of information, and then applying this definition to the study of communication. Coding and the effect of noise on the system will be discussed. In the last part of the course upper bounds on the rate at which a process can transmit information will be obtained. *Prerequisite:* E&CE 327 or Math 301.

E&CE 320—ELECTRONICS I—2 cr. (2 and 0) F, S

The fundamental principles of solid-state electronic devices including the structural properties of semiconductors, charge carrier motion, p-n junction theory, and electrical circuit models of transistors. Emphasis is given to the physical principles describing the operation of modern electronics components. *Prerequisite:* Phys 221, 222.

E&CE 321—ELECTRONICS II—2 cr. (2 and 0) F, S

Solid-state circuit theory covering the design of small signal—low frequency amplifiers and multistage and feedback systems; applications involving operational amplifiers, field effect transistors, and integrated circuits are covered. *Prerequisite:* E&CE 320, 330, 331.

E&CE 325—ELECTRONICS AND ELECTROMAGNETICS LABORATORY I—1 cr. (0 and 2) F, S

Laboratory projects dealing with instrumentation and measurement procedures associated with solid-state electronic devices and electromagnetic fields. *Prerequisite:* Concurrent enrollment in E&CE 320, 340.

E&CE 326—ELECTRONICS AND ELECTROMAGNETICS LABORATORY II—1 cr. (0 and 2) F, S

Experimentation in electronics circuits design and electronic systems analysis, including integrated circuits. Projects relating to studies of time varying fields, transmission lines, wave guides, and antennas are included. *Prerequisite:* E&CE 325. Concurrent enrollment in E&CE 321, 341.

E&CE 327—ENGINEERING APPLICATIONS OF PROBABILITY AND RANDOM VARIABLES—3 cr. (3 and 0) F
An introduction to probability and random variables with emphasis on engineering applications. Subjects which will be covered include: probability space, conditional probabilities, independent events, Bernoulii trials, random variables, distribution functions, functions of random variables, and correlation and power spectrum of stationary random processes. *Prerequisite:* Math 208.

E&CE 329—LOGIC AND COMPUTING DEVICES—3 cr. (2 and 2) F, S
A study of logic with an introduction to propositional calculus and Boolean Algebra. Number systems and representation of information. The use of electric devices to implement logic functions and computing elements. The organization and structure of computing systems. *Prerequisite:* Approval of department.

E&CE 330—SYSTEMS I—3 cr. (3 and 0) F, S
The systems concept and system analysis methods are developed. The system model is developed through the study of functions and data forms, perfect drivers, response, two terminal elements, system geometry, linear algebra and subsystems. Branch, node, mesh, and state models are considered. Solution methods include the use of the analog and digital computer. Nonlinear components are introduced in simple systems. *Prerequisite:* Math 208 or approval of department.

E&CE H330—SYSTEMS I—3 cr. (3 and 0) F, S
Honors section of E&CE 330; admission by invitation.

E&CE 331—ELECTRIC CIRCUITS WORKSHOP I—3 cr. (2 and 2) F, S
Computational sessions, demonstrations and laboratory projects are coordinated with E&CE 330 (Systems I) in the area of electrical phenomenon. Electrical instrumentation and measurement procedures are introduced to illustrate component modeling and network response. Applications involving both continuous and discrete behavior are discussed. Problem solving using digital and analog computers is emphasized. *Prerequisite:* Concurrent enrollment with E&CE 330.

E&CE H331—ELECTRIC CIRCUITS WORKSHOP I—3 cr. (2 and 2)
Honors section of E&CE 331; admission by invitation.

E&CE 332—SYSTEMS II—2 cr. (2 and 0)
A continuation of Systems I. Transforms of equations and functions and formulation of system equations in the S-domain. Two-part and N-terminal components studies include input-output and transfer parameters, measurement procedures, and system reduction methods. Solution methods include the use of transforms, analog computers and digital computers. Optimization methods are introduced. *Prerequisite:* E&CE 330.

E&CE 333—ELECTRIC CIRCUITS WORKSHOP II—3 cr. (2 and 2) F, S
A continuation of E&CE 331. Transfer function concepts, multiterminal component modeling and computer simulations are among topics covered. A variety of electrical devices and systems are discussed including machinery and other energy conversion and solid-state devices. *Prerequisite:* Concurrent enrollment in E&CE 332.

E&CE 340—ELECTRIC AND MAGNETIC FIELDS I—2 cr. (2 and 0) F, S
An introduction to classical electromagnetics. Topics include vector analysis, Coulomb's law, electric field intensity, Gauss's law, potential theory, solution of Laplace's equation, D.C. magnetic fields, magnetic circuits and devices, and forces in magnetic fields. *Prerequisite:* Math 208.

E&CE 341—ELECTRIC AND MAGNETIC FIELDS II—2 cr. (2 and 0) F, S
Continuation of E&CE 340 to include time-varying fields, Maxwell's equations, transmission lines, waveguides, and antennas. *Prerequisite:* E&CE 340.

E&CE 350—PRINCIPLES OF DIGITAL COMPUTER SYSTEMS—3 cr. (2 and 2) F
Introduction to machine structure and programming systems. Topics include: general machine organization and operation, information flow within a machine, internal and external data types and structures, data transfers and communication with external devices, and interrelation between software and hardware. The various levels of programming systems are considered, but the main emphasis is placed on machine language. *Prerequisite:* Approval of department.

E&CE 351—REAL-TIME APPLICATION OF DIGITAL COMPUTERS—3 cr. (2 and 2) S
Introduction to the application and operation of digital computers in a real-time or time-critical environment. Topics include: interrupt and data-break facilities, analog-to-digital and digital-to-analog signal conversion, timing considerations, digital computer interfaces, and on-line acquisition and reduction of data. Software concepts include multitask real-time executives, schedulers, dynamic resource allocation algorithms, level executors, background-foreground systems, and device handlers. *Prerequisite:* E&CE 350 or approval of department.

E&CE 352—MACHINES, LANGUAGES, AND ALGORITHMS—3 cr. (3 and 0) S
An introduction to several theoretical topics necessary for a broad fundamental knowledge of computation. The topics covered fall generally into three major areas: finite state models, formal languages, and computability. Emphasis is placed on relating formalisms to practical considerations such as logical design of digital machines and the limitations of machine computation. *Prerequisite:* Junior standing in Engineering or Physical Sciences or approval of department.

E&CE 401—SEMINAR—1 cr. (1 and 0)
Emphasis is placed on methods of presenting engineering concepts appropriate to an industrial environment. Recent developments in the field of electrical engineering are discussed as examples with consideration being given to their economic as well as scientific significance. A library research paper is a required part of the course. *Prerequisite:* Senior standing.

E&CE 403—ENERGY CONVERSION—3 cr. (3 and 0) F
Various methods of energy conversion, both electromechanical and direct. Fuel cells, magnetohydrodynamics, nuclear and other methods are discussed along with more conventional systems. *Prerequisite:* Approval of department.

E&CE 404—SEMICONDUCTOR DEVICES—2 cr. (2 and 0) S
Consideration of the principles of operation, the external characteristics, and the applications of some of the more important semiconductor devices presently

available. *Prerequisite:* Introductory Electronics course and approval of department.

E&CE 405—Special Problems—Variable credit. F, S

Electrical Engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. *Prerequisite:* Approval of department.

E&CE H405—Special Problems—Variable credit.

A special honors course of Electrical Engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. *Prerequisite:* Approval of department.

E&CE 406—Introduction to Integrated Circuits—3 cr. (3 and 0) F

Integrated circuit technology, devices and applications. Discussion of fabrication methods, survey of standard circuit characteristics, design and layout principles, linear and digital circuit applications. *Prerequisite:* Senior standing.

E&CE 410—Systems III—3 cr. (3 and 0) F, S

An extension of Systems II into more advanced topics including flow concepts, stability, synthesis, optimization, and analysis with digital machines using—CSMP-ECAP and other simulation programs. *Prerequisite:* E&CE 332.

E&CE 411—Electrical Systems Workshop—2 cr. (0 and 4) F, S

A continuation of E&CE 333. Larger more complex systems are considered. Projects illustrating state space and classical control theory are undertaken. Network synthesis and analysis through digital simulations are also covered. *Prerequisite:* E&CE 333.

E&CE 412—Digital Control Systems—3 cr. (3 and 0) S

A discussion of the technical and economic aspects of the field of digital control. Major emphasis is placed on the various hardware, installation, and use topics in the field as well as theoretical discussions of the theory of computer automatic control and systems optimization. A comprehensive preview of the status of current theoretical investigations and their place in the industrial control scene. Associated computer control hardware, such as process sensors, signal systems, and final control elements are also examined. Digital and hybrid simulation studies, as well as logic control system designs augment the theoretical presentations.

E&CE 419—Electrical Machinery Laboratory I—1 cr. (0 and 2) F

A laboratory course designed to accompany E&CE 421. Includes measurements of A.C. and D.C. machine parameters, analog computer simulation with emphasis on control. *Prerequisite:* Enrollment in E&CE 421.

E&CE 420—Power Systems Analysis—3 cr. (3 and 0) S

Study of electric power system operation. Subjects covered include transmission lines, load-flow studies, economic dispatching, symmetrical components, fault calculations, and introduction to power system stability. *Prerequisite:* E&CE 312.

E&CE 421—ELECTRICAL MACHINERY—3 cr. (3 and 0) F

Characteristics of A.C. and D.C. machines are studied with emphasis on dynamic operation and control. *Prerequisite:* E&CE 333, 341.

E&CE 422—ELECTRONICS III—2 cr. (2 and 0) F, S

An introduction to logic circuits, switching devices, and electronic storage systems. Frequency response of electronic components and systems, oscillator fundamentals, principles of modulation and power supply design are also covered. *Prerequisite:* E&CE 321, 333.

E&CE 426—DIGITAL COMPUTER DESIGN—3 cr. (3 and 0) S

Design of the basic arithmetic and logical units of a digital computer. Study of timing and control problems. Design of a small computing system. *Prerequisite:* E&CE 329.

E&CE 427—OPERATIONAL AMPLIFIERS—2 cr. (2 and 0) S

The fundamentals, design, and applications of the operational amplifier. *Prerequisite:* E&CE 320 or equivalent.

E&CE 428—COMMUNICATIONS THEORY I—3 cr. (3 and 0) F

A course in modern communications theory. Topics covered are Fourier transforms, power spectra, correlation, signals in linear networks, amplitude modulation, frequency modulation, sampling and pulse modulation. *Prerequisite:* E&CE 321.

E&CE 429—COMPUTER ORGANIZATION—3 cr. (3 and 0) F

A computer system is organized as a collection of subsystems. The functional characteristics of each subsystem along with the information flow and interactions between these subsystems are studied. The functional specifications of selected computer systems are discussed to illustrate representative computer organizations. The interaction of hardware and software is stressed. Topics include: bus structures, memory organization and heirarchy, memory protection, memory relocation and allocation techniques, interrupt structures, arithmetic units, input-output structures, state generation, central processor organization, and control function implementation. *Prerequisite:* E&CE 350, 351, or approval of department.

E&CE 430—COMMUNICATIONS THEORY II—3 cr. (3 and 0) S

A continuation of E&CE 428 with emphasis on the statistical properties of signals. Topics covered are random signals and noise, signal space and continuous channels, digital data systems, optimum detection theory. *Prerequisite:* E&CE 327, 428.

E&CE 431—DIGITAL ELECTRONICS—3 cr. (3 and 0) S

Electronic devices and circuits of importance to digital computer operation. Active and passive waveshaping, waveform generation, memory, switching, and logic circuits are topics included. *Prerequisite:* E&CE 321.

E&CE 432—INSTRUMENTATION—3 cr. (3 and 0) F

Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments will be considered. Transduction devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature will be discussed. *Prerequisite:* E&CE 321 or approval of department.

E&CE 433—Digital Electronics Laboratory—1 cr. (0 and 2) S

A laboratory course designed to accompany E&CE 431. *Prerequisite:* Concurrent registration in E&CE 431.

E&CE 434—Power Electronics—3 cr. (3 and 0) F

A study of electronic devices and systems which are designed to control or regulate large amounts of power. Included are SCR applications to inverters, motor controls, high-current power supplies, frequency converters, etc. Also, high-current switching systems, voltage stabilizers, and other power applications of electronics are considered. *Prerequisite:* E&CE 422.

E&CE 435—Communications Circuits—3 cr. (3 and 0) S

Communication circuits used in amplification, modulation, detection and other signal processing in modern communication systems. Recent developments in electronic devices, such as integrated circuits, will be considered as circuit components along with other solid state and vacuum electronic devices. *Prerequisite:* E&CE 422.

E&CE 436—Radiation and Wave Propagation—3 cr. (3 and 0) F

Electromagnetic waves, waveguides, and antennas. *Prerequisite:* E&CE 341.

E&CE 437—Laser Technology and Applications—3 cr. (3 and 0) S

An introduction to the design factors and operating principles of solid-state, gas, and semiconductor lasers, couched in the language of electrical engineering and electron physics. Applications of laser technology to such areas as communications, computers, measurements, and medicine are presented. The theory and applications of holography are explored. Special problems and demonstrations relative to electrical engineering application of lasers are designed to augment the theoretical presentations.

E&CE 438—Process Instrumentation and Control Systems—3 cr. (3 and 0) F

The development of process instrumentation and control systems are examined with an emphasis on complete systems planning and design. All aspects of process measurement and control problems are presented beginning with the acquired data and ending with a control signal from a final control element. Hardware concepts and techniques are emphasized. *Prerequisite:* E&CE 432 or consent of instructor.

E&CE 450—Systems IV—3 cr. (3 and 0) F, S

A continuation of Systems III. Modern control system concepts including matrices and vector spaces, state equations, sample data systems, controllability and observability, nonlinear systems and synthesis. Also advanced computations in optimizing parametric programming and simulation are done using the analog, digital, and hybrid computers. *Prerequisite*: E&CE 410.

E&CE 451—System Design Workshop—2 cr. (0 and 4) F, S

A project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Prerequisite:* E&CE 411.

E&CE 452—Programming Systems—3 cr. (3 and 0) S

A second course in programming languages and systems. Topics include: assemblers, compilers and syntactical methods; string manipulation and list processing; concepts of executive programs and operating systems; introduction to time-sharing systems. *Prerequisite:* E&CE 350; 352 is recommended.

E&CE 460—COMPUTER-AIDED ANALYSIS AND DESIGN—3 cr. (3 and 0) F
Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in the modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Prerequisite:* E&CE 332 or approval of department.

E&CE 461—ANALOG/HYBRID COMPUTATION AND SIMULATION—3 cr. (2 and 2) S
A continuation of the introductory analog concepts considered in E&CE 331 and 333. Topics include nonlinear modeling, function generation, signal processing, and an introduction to hybrid computing. *Prerequisite:* E&CE 333 or approval of department.

E&CE 603—ENERGY CONVERSION—3 cr. (3 and 0)

E&CE 606—INTRODUCTION TO INTEGRATED CIRCUITS—3 cr. (3 and 0)

E&CE 610—SYSTEMS III—3 cr. (3 and 0)

E&CE 611—ELECTRICAL SYSTEMS WORKSHOP—2 cr. (0 and 4)

E&CE 612—DIGITAL CONTROL SYSTEMS—3 cr. (3 and 0)

E&CE 619—ELECTRICAL MACHINERY LABORATORY I—1 cr. (0 and 2)

E&CE 620—POWER SYSTEM ANALYSIS—3 cr. (3 and 0)

E&CE 621—ELECTRICAL MACHINERY—3 cr. (3 and 0)

E&CE 622—ELECTRONICS III—2 cr. (2 and 0)

E&CE 626—DIGITAL COMPUTER DESIGN—3 cr. (3 and 0)

E&CE 627—OPERATIONAL AMPLIFIERS—2 cr. (2 and 0)

E&CE 628—COMMUNICATIONS THEORY I—3 cr. (3 and 0)

E&CE 629—COMPUTER ORGANIZATION—3 cr. (3 and 0)

E&CE 630—COMMUNICATIONS THEORY II—3 cr. (3 and 0)

E&CE 631—DIGITAL ELECTRONICS—3 cr. (3 and 0)

E&CE 632—INSTRUMENTATION—3 cr. (3 and 0)

E&CE 633—DIGITAL ELECTRONICS LABORATORY—1 cr. (0 and 2)

E&CE 634—POWER ELECTRONICS—3 cr. (3 and 0)

E&CE 635—COMMUNICATIONS CIRCUITS—3 cr. (3 and 0)

E&CE 636—RADIATION AND WAVE PROPAGATION—3 cr. (3 and 0)

E&CE 637—LASER TECHNOLOGY AND APPLICATIONS—3 cr. (3 and 0)

E&CE 638—PROCESS INSTRUMENTATION AND CONTROL SYSTEMS—3 cr. (3 and 0)

E&CE 650—SYSTEMS IV—3 cr. (3 and 0)

E&CE 651—SYSTEM DESIGN WORKSHOP—2 cr. (0 and 4)

E&CE 652—PROGRAMMING SYSTEMS—3 cr. (3 and 0)

E&CE 660—COMPUTER-AIDED ANALYSIS AND DESIGN—3 cr. (3 and 0)

E&CE 661—ANALOG/HYBRID COMPUTATION AND SIMULATION—3 cr. (2 and 2)

E&CE 801—ANALYSIS OF LINEAR SYSTEMS I—3 cr. (3 and 0)

E&CE 802—ANALYSIS OF LINEAR SYSTEMS II—3 cr. (3 and 0)

E&CE 803—SEMINAR—1 cr. (1 and 0)

E&CE 804—NETWORK SYNTHESIS I—3 cr. (3 and 0)

E&CE 805—NETWORK SYNTHESIS II—3 cr. (3 and 0)

E&CE 806—NONLINEAR NETWORKS AND SYSTEMS I—3 cr. (3 and 0)

E&CE 807—POWER SYSTEM STABILITY—3 cr. (3 and 0)

E&CE 808—ENERGY CONVERSION—3 cr. (3 and 0)

E&CE 809—ADVANCED COMPUTER CONTROL SYSTEMS—3 cr. (3 and 0)

E&CE 810—MODERN CONTROL THEORY I—3 cr. (3 and 0)

E&CE 811—MODERN CONTROL THEORY II—3 cr. (3 and 0)

E&CE 812—SAMPLED DATA SYSTEMS—3 cr. (3 and 0)

E&CE 814—NONLINEAR AUTOMATIC CONTROLS—3 cr. (3 and 0)

E&CE 815—RANDOM DATA MEASUREMENTS AND ANALYSIS—3 cr. (3 and 0)

E&CE 816—LINEAR INTEGRATED CIRCUITS—3 cr. (3 and 0)

E&CE 819—DETECTION AND ESTIMATION THEORY—3 cr. (3 and 0)

E&CE 820—THEORY OF COMMUNICATIONS I—3 cr. (3 and 0)

E&CE 821—THEORY OF COMMUNICATIONS II—3 cr. (3 and 0)

E&CE 822—INFORMATION THEORY—3 cr. (3 and 0)

E&CE 823—INTEGRATED CIRCUIT TECHNOLOGY—3 cr. (3 and 0)

E&CE 824—APPLICATIONS OF INTEGRATED CIRCUITS—3 cr. (3 and 0)

E&CE 825—SOLID-STATE ELECTRONICS—3 cr. (3 and 0)

E&CE 826—LARGE-SCALE INTEGRATION—3 cr. (3 and 0)

E&CE 827—INSTRUMENTATION AND MEASUREMENTS—3 cr. (3 and 0)

E&CE 830—ELECTROMAGNETICS I—3 cr. (3 and 0)

E&CE 831—ELECTROMAGNETICS II—3 cr. (3 and 0)

E&CE 832—ANTENNA THEORY I—3 cr. (3 and 0)

E&CE 834—MICROWAVE ELECTRONICS—3 cr. (3 and 0)

E&CE 836—OPTICAL ELECTROMAGNETICS AND QUANTUM ELECTRONICS—3 cr. (3 and 0)

E&CE 844—DIGITAL SIGNAL PROCESSING—3 cr. (3 and 0)

E&CE 850—COMPUTATION AND SIMULATION—3 cr. (3 and 0)

E&CE 851—Theory and Design of Digital-Analog Machines—3 cr. (3 and 0)

E&CE 852—Digital Computers and Information Processing—3 cr. (3 and 0)

E&CE 853—Computer Data Displays—3 cr. (3 and 0)

E&CE 854—Advanced Simulation Studies—3 cr. (3 and 0)

E&CE 855—Artificial Intelligence—3 cr. (3 and 0)

E&CE 856—Pattern Recognition—3 cr. (3 and 0)

E&CE 857—Coding Theory—3 cr. (3 and 0)

E&CE 858—Automata Theory—3 cr. (3 and 0)

E&CE 860—Engineering Application of Optimization—3 cr. (3 and 0)

E&CE 861—Foundation and Methodology of Systems Engineering—3 cr. (3 and 0)

E&CE 863—Advanced Physical Systems I—3 cr. (3 and 0)

E&CE 864—Advanced Physical Systems II—3 cr. (3 and 0)

E&CE 870—Biosystems Analysis—3 cr. (3 and 0)

E&CE 890—Selected Topics in Electrical Engineering—3 cr. (3 and 0)

E&CE 891—Research—3 cr.

E&CE 991—Doctoral Research—Credit to be arranged.

ENGINEERING

Engr 180—Engineering Concepts—3 cr. (2 and 2)
An introduction to the profession of engineering. An analysis of role and responsibilities of the engineer in contemporary society. The engineering process, from problem formulation to the evolution of creative design, is demonstrated through comprehensive project studies. The course provides the student with insight into the relationship between science and engineering through discussions of typical problems frequently encountered in engineering systems. The course emphasizes the utility and significance of computing devices in present-day engineering practice. An introduction to computer programming and a discussion of computer system architecture are among the topics covered.

Engr 491—Seminar—1-3 cr. (1-3 and 0)
A study of the dynamic role of engineering in relationship to man and his environment. Topics not covered in formal courses will be presented to keep students abreast of today's rapidly changing technology. *Prerequisite:* Permission of instructor.

ENGINEERING GRAPHICS

Professor: E. Laitala, *Head*

Associate Professors: B. E. Dunkle, A. F. Hammond, L. H. Jameson, C. M. McHugh

Assistant Professors: C. W. Carter, C. D. Meeks

Instructor: C. O. Huey

EG 101—Freehand Sketching—1 cr. (0 and 3)

Principles of technical sketching, including the development of skills in technical lettering and freehand orthographic and pictorial drawing.

EG 103—Engineering Communications—3 cr. (1 and 6)

The role of engineering communication in engineering and management. Graphic communication includes lettering, sketching, orthographic projection, auxiliary projection, sections and conventional practices, dimensioning, working drawings. Architectural drawing, charts and graphs, presentation techniques. Manufacturing philosophy; interrelation between product design and production processes. For Industrial Management majors.

EG 104—Engineering Communication and Design—2 cr. (0 and 6)

The role of engineering communication from the manager's point of view. Working drawings relating product design and production processes. Architectural drawing nomography, charts and graphs, presentation techniques. *Prerequisite:* EG 109 or consent of instructor.

EG 105—Engineering Graphics—2 cr. (0 and 6)

A course in graphical communication. Freehand sketching, orthographic and auxiliary projection, sectional views, and conventional practices, dimensioning, reading drawings.

EG 109—Engineering Graphical Communication—2 cr. (0 and 6)

Graphical methods of communicating ideas and information in engineering. Development of the student's ability to visualize three dimensional forms and spatial relationships through the study of creative freehand sketching and basic fundamentals of engineering representation. Use of drafting aids, introduction to computer graphics, curve plotting, reproduction methods.

EG 110—Engineering Communication (For Technical Operations)—2 cr. (0 and 6)

A continuation of EG 109. Emphasis is placed on engineering drawing as a means of expressing a design. Standard practices and procedures. Dimensioning for interchangeability, numerical control, and quantity production. Component design. Developments and intersections. *Prerequisite:* EG 109.

EG 201—Engineering Graphics for Industrial Education—3 cr. (1 and 6)

A comprehensive study of Engineering Graphics fundamentals. The course includes lettering, use of instruments, technical sketching, multi-viewing drawing, auxiliary projection, descriptive geometry, sectional views, dimensioning, fasterners, detail and assembly drawings.

EG 202—Graphical Technology for Industrial Education—3 cr. (1 and 6)

Continuation of EG 201 with emphasis on depth in graphical communication. Working drawings to include detail and assembly drawings. Intersections and developments. Specifications, standards. Architectural drawings. Production illustration, pedagogy of graphics, pragmatic and creative design. *Prerequisite:* EG 201.

EG 301—ADVANCED ENGINEERING GRAPHICS—3 cr. (1 and 6)
Application of the fundamental principles of Engineering Graphics to the solution of three dimensional spatial problems in the design of various engineering systems. Creative functional design, introduction to graphical kinematics and computer-aided design. *Prerequisite:* EG 109 or 202.

EG 302—GRAPHICAL COMPUTATION—3 cr. (2 and 3)
Graphic layouts of empirical equations. The application of graphical solution of equations, nomography, and the graphical calculus to the solution of problems in engineering and science. Graphical solution of differential equations. *Prerequisite:* EG 109, Math 106 or equivalent.

ENGINEERING MANAGEMENT

Professors: C. C. DAVIS, B. J. TODD, C. H. WHITEHURST, JR.

Associate Professors: F. R. GRAY, E. A. LAROCHE, G. D. RIGGS,* C. O. SHULER, C. R. SMITH, J. M. WANNAMAKER

Assistant Professors: T. H. GUNTER, JR., J. A. TURNER

EMGT 910—SEMINAR IN PRODUCTION MANAGEMENT—2 cr. (2 and 0)

EMGT 911—SEMINAR IN DECISION THEORY—2 cr. (2 and 0)

EMGT 912—SEMINAR IN FINANCE—3 cr. (3 and 0)

EMGT 913—SYSTEMS ANALYSIS—3 cr. (3 and 0)

EMGT 991—DOCTORAL RESEARCH—Credit to be arranged.

ENGINEERING MECHANICS

Professors: N. R. BAULD, JR., R. W. MOORMAN, *Head*

Associate Professors: W. E. CASTRO, R. E. ELLING, J. G. GOREE, A. G. LAW,* R. F. NOWACK, M. K. RICHARDSON, P. B. ZIELINSKI

Assistant Professors: E. H. LAW, C. R. MITCHELL

EM 200—STATICS (SCALAR)—3 cr. (3 and 0)
Forces and force systems and their external effect on bodies; principally the condition of equilibrium for two-dimensional structures. Both analytical and graphical techniques are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Math 108.

EM 201—ENGINEERING MECHANICS (STATICS)—3 cr. (3 and 0)
Forces and force systems and their external effect on bodies; principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, concurrent registration in Math 206.

EM H201—ENGINEERING MECHANICS (STATICS)—3 cr. (3 and 0)
An honors section of EM 201; admission by invitation.

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* On leave.

EM 202—Engineering Mechanics (Dynamics)—3 cr. (3 and 0)
A continuation of EM 201. The principal topics are kinematics and kinetics of particles and rigid bodies of finite size. Techniques of vector mathematics are employed. *Prerequisite:* EM 201, Math 206.

EM H202—Engineering Mechanics (Dynamics)—3 cr. (3 and 0)
An honors section of EM 202; admission by invitation.

EM 211—Particle Mechanics: Statics and Dynamics—3 cr. (3 and 0)
Force and force systems and their effect on particles; the conditions of equilibrium and the kinematics and kinetics of particle motion. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, Math 206.

EM 304—Mechanics of Materials—3 cr. (3 and 0)
The relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. *Prerequisite:* EM 201, Math 206.

EM H304—Mechanics of Materials—3 cr. (3 and 0)
An honors section of EM 304; admission by invitation.

EM 305—Mechanics of Materials Laboratory—1 cr. (0 and 3)
Theoretical relationships considered in EM 304 are verified. Students observe the behavior under load and the failure of engineering materials; identify and evaluate mechanical properties of materials important to design and manufacturing processes; and are acquainted with various testing methods, testing machines, and instruments. *Prerequisite:* Must be accompanied or preceded by EM 304.

EM 320—Fluid Mechanics—3 cr. (3 and 0)
The behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is placed upon a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Prerequisite:* EM 202 or 211.

EM H320—Fluid Mechanics—3 cr. (3 and 0)
An honors section of EM 320; admission by invitation.

EM 322—Fluid Mechanics Laboratory—1 cr. (0 and 3)
The principles developed in EM 320 are verified and demonstrated. Familiarization with orderly techniques in organizing and reporting results of experimental investigations and with the use of instruments and equipment is afforded. *Prerequisite:* Must be accompanied or preceded by EM 320.

EM 421—Hydrology and Hydraulics—2 cr. (2 and 0)
Elements of surface water and ground water hydrology are introduced and applied to engineering problems. Special topics of open channel hydraulics and water distribution systems are developed from the fundamentals of fluid mechanics. *Prerequisite:* EM 320.

EM 425—Advanced Mechanics of Materials—3 cr. (3 and 0)
A continuation of EM 304. This course includes traditional topics in strength of materials, such as shear center, unsymmetrical bending, torsion

of noncircular sections, curved members, and elastic stability. Additionally, there are introduced topics from theory of elasticity as related to simple bending and torsion problems. *Prerequisite:* EM 304.

EM 450—MECHANICAL VIBRATIONS—3 cr. (3 and 0)
Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include: linear free vibrations, forced vibrations and damping in single degree of freedom systems, transient response, multidegree of freedom systems with lumped parameters, Lagrange's equations. *Prerequisite:* EM 202, 304, Math 208.

EM 470—EXPERIMENTAL STRESS ANALYSIS I—3 cr. (2 and 3)
Experimental analysis of static and dynamic stress fields. Emphasis is on the techniques required to obtain data and the theoretical analysis required for proper interpretation. Methods and instrumentation associated with strain gages (including transducer applications), Moiré grids, brittle coatings, birefringent coatings, and photoelasticity are studied. *Prerequisite:* EM 304 and permission of instructor.

EM 621—HYDROLOGY AND HYDRAULICS—2 cr. (2 and 0)

EM 625—ADVANCED MECHANICS OF MATERIALS—3 cr. (3 and 0)

EM 650—MECHANICAL VIBRATIONS—3 cr. (3 and 0)

EM 670—EXPERIMENTAL STRESS ANALYSIS I—3 cr. (2 and 3)

EM 802—EXPERIMENTAL STRESS ANALYSIS II—3 cr. (2 and 3)

EM 821—CONTINUUM MECHANICS—3 cr. (3 and 0)

EM 823—DIMENSIONAL ANALYSIS AND DYNAMIC SIMILARITY—3 cr. (3 and 0)

EM 827—TOPICS IN ANALYTICAL MECHANICS—3 cr. (3 and 0)

EM 829—ENERGY METHODS AND VARIATIONAL PRINCIPLES—3 cr. (3 and 0)

EM 831—THEORY OF ELASTICITY I—3 cr. (3 and 0)

EM 832—THEORY OF ELASTICITY II—3 cr. (3 and 0)

EM 834—THEORY OF ELASTIC STABILITY—3 cr. (3 and 0)

EM 845—INTERMEDIATE DYNAMICS—3 cr. (3 and 0)

EM 881—SPECIAL PROBLEMS—3 cr. (3 and 0)

EM 889—SEMINAR—0-1 cr. (1 and 0)

EM 890—SEMINAR—0-1 cr. (1 and 0)

EM 891—RESEARCH—Credit to be arranged.

EM 932—THEORY OF PLASTICITY—3 cr. (3 and 0)

EM 980—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 981—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 982—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 983—SPECIAL TOPICS IN MECHANICS—3 cr. (3 and 0)

EM 991—DOCTORAL RESEARCH—Credit to be arranged.

ENGLISH

Professors: R. J. Calhoun, H. M. Cox, C. B. Green, Harriet R. Holman, M. A. Owings, *Head*

Associate Professors: C. O. Caskey, A. J. Fear, H. M. Felder, Jr., C. Gum, L. L. Henry, A. H. Holt, J. L. Idol, C. M. McGee, Jr., J. J. McLaughlin, N. Olsen, Jr., Corinne Sawyer, M. S. Steadman, Jr., M. O. Usrey, C. H. Watson, E. P. Willey, J. P. Winter

Assistant Professors: R. E. Barfield, R. F. Barton, J. D. Blanche,* H. B. Bryant, R. L. Cross, T. E. Douglass, H. B. Hannah, R. W. Hill, A. L. Recoulley, III, R. O. Rogers, V. A. Rudowski, J. B. Simms, B. N. Skardon, R. A. Underwood, C. H. Woodell

Instructors: H. R. Bettich, W. V. Bost, Joan T. Cross, S. K. Eisiminger, Virginia L. Ganim, D. N. Griffin, R. B. Heaton, Jr., R. F. Lunsford, C. L. Montgomery, Jr., G. Poster, III, Janice L. Sargent

Engl 011—English—5 cr. (5 and 0)
Writing centered around sentence structure and the single paragraph. Prose readings to accompany classwork.

Engl 013—English—5 cr. (5 and 0)
Extensive writing of compositions longer than a paragraph. Prose, nonfiction readings to accompany classwork.

Engl 101—English Composition—3 cr. (3 and 0)
Training in correct and effective expression, in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods.

Engl H101—English Composition—3 cr. (3 and 0)
Honors section of Engl 101; admission by invitation.

Engl 102—English Composition—3 cr. (3 and 0)
Continued emphasis on correct and effective expression; an introduction to nonfiction prose, fiction, drama, and poetry; training in the organization and writing of the research report. *Prerequisite:* Engl 101.

Engl H102—English Composition—3 cr. (3 and 0)
Honors section of Engl 102; admission by invitation.

Engl 105—Fundamentals of Oral Communication—3 cr. (3 and 0)
Introduction to the problems of oral communication in the following areas: oral reading, listening, discussion, speaking, with emphasis on individual needs; oral exercises.

Engl 111—English for Foreign Students—3 cr. (3 and 2)
A special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examinations in oral English.

Engl 203—A Survey of English Literature—3 cr. (3 and 0)
Chief British authors and works from Beowulf to the Romantic period; continued emphasis on composition. *Prerequisite:* Engl 102.

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* On leave.

Engl H203—Survey of English Literature—3 cr. (3 and 0)
Honors section of Engl 203; admission by invitation.

Engl 204—A Survey of English Literature—3 cr. (3 and 0)
Chief British authors and works from Romantic period to the present. Proficiency in composition must be demonstrated. *Prerequisite:* Sophomore standing or permission of department.

Engl H204—Survey of English Literature—3 cr. (3 and 0)
Honors section of Engl 204; admission by invitation.

Engl 205—American Literature I—3 cr. (3 and 0)
A survey of American literature to the Civil War, with emphasis on major writers. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

Engl 206—American Literature II—3 cr. (3 and 0)
A survey of American literature from the Civil War to the present, with emphasis on major writers. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

Engl 207—A Survey of World Literature I—3 cr. (3 and 0)
Translations from the Hellenic, Hebraic, and Oriental Worlds, with emphasis on major authors. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

Engl 208—A Survey of World Literature II—3 cr. (3 and 0)
Translations from the Medieval, Renaissance, and Modern Worlds, with emphasis on major writers. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

Engl 215—Introduction to Drama—3 cr. (3 and 0)
Introduction to drama as a literary form through readings of representative plays from Aeschylus to Ibsen. *Prerequisite:* Engl 101, 102.

Engl 217—Vocabulary Building—3 cr. (3 and 0)
Development of a useful, discriminating vocabulary for writing, speaking, and reading. Student notebooks and proficiency quizzes. *Prerequisite:* Engl 101, 102.

Engl 221—The Classics in Translation—3 cr. (3 and 0)
An examination of the whole of the *The Iliad, The Odyssey, Hesiod's Theogony, The Aeneid, The Metamorphoses,* Apuleius's *The Golden Asse,* and selections from Herodotus and Tacitus. *Prerequisite:* Engl 101, 102.

Engl 222—Mythology—3 cr. (3 and 0)
Great myths of the world, with applications to literature.

Engl 223—Continental Fiction in Translation—3 cr. (3 and 0)
Selected fiction of the European masters, primarily Russian, French, German, and Spanish. *Prerequisite:* Engl 101, 102.

Engl 231—Introduction to Journalism—3 cr. (3 and 0)
Instruction and practice in writing for mass media; editorial responsibilities. *Prerequisite:* Engl 102.

Engl 232—Introduction to Broadcasting—3 cr. (3 and 0)
The history and scope of radio and television broadcasting in America.

ENGL 240—BLACK AMERICAN LITERATURE—3 cr. (3 and 0)
Black American literature from its beginning to the present. A critical examination of essays, short stories, novels, drama, and poetry produced by the Black American. *Prerequisite:* Engl 101, 102.

ENGL 300—JOURNALISM WORKSHOP—1 cr. (1 and 0)
Responsibilities and duties of students editing uncensored publications; criticism of student publications. Open only to members of publication staffs. *Prerequisite:* Engl 102.

ENGL 301—PUBLIC SPEAKING—3 cr. (3 and 0)
Practical training in public speaking; attention to diction, voice, and platform presence; an introduction to parliamentary procedure; practice in preparing and delivering short speeches. *Prerequisite:* Sophomore standing.

ENGL 302—PERSUASION—3 cr. (3 and 0)
The theories and art of ethical oral persuasion. The composition and delivery of speeches of a persuasive nature to convince, to stimulate, and to actuate. *Prerequisite:* Engl 105 or 301.

ENGL 303—VOICE AND DICTION—3 cr. (3 and 0)
Practical training in speech, with emphasis on clarity, vocal variety, and tone quality.

ENGL 304—ADVANCED COMPOSITION—3 cr. (3 and 0)
Supervised writing for students of advanced standing, each student undertaking projects according to his interest; some attention to reports, business letters, research methods and materials. Weekly papers and some larger exercises. Limited enrollment. *Prerequisite:* Sophomore English.

ENGL 305—ORAL INTERPRETATION OF LITERATURE—3 cr. (3 and 0)
Analysis and oral interpretation of selected poetry and prose; training in development of effective tone production. *Prerequisite:* Engl 101, 102.

ENGL 306—FORENSIC LABORATORY—1 cr. (0 and 3)
Organized preparation for participation in college speech activities. Intercollegiate, campus, and community programs.

ENGL 307—ARGUMENTATION AND DEBATE—3 cr. (3 and 0)
The basic principles of argumentation with emphasis on developing practical skills in argumentative speech. The role of the advocate in contemporary society and an analysis of selected significant debates in U.S. history. *Prerequisite:* Permission of instructor.

ENGL 308—PRINCIPLES OF ACTING—3 cr. (3 and 0)
Acting for the stage, basic techniques of characterization, audition procedures, exercises in emotional recall and pantomime, experience in supervised performance. *Prerequisite:* Engl 101, 102.

ENGL 309—STAGE DIRECTION—3 cr. (3 and 0)
A laboratory class designed to prepare students to direct plays and supervise other theatre activities for educational institutions or civic organizations. *Prerequisite:* Engl 308 or 310.

ENGL 310—INTRODUCTION TO THE THEATRE—3 cr. (3 and 0)
The history of play production from the Greeks to modern times. The role of lighting, costuming, set design and other elements in play production. *Prerequisite:* Junior standing.

Engl 311—Theatre Laboratory—1 cr. (0 and 3)
Participation in theatre production including stage management, direction, costume, makeup, lighting, sound, scenery, and business management. No formal class meetings. One credit. May be repeated for a total of three credits. *Prerequisite:* Sophomore standing and permission of instructor.

Engl 331—Creative Writing—3 cr. (3 and 0)
The technique of non-expository writing—narration, description, dramatization. *Prerequisite:* Sophomore standing or higher and permission of instructor.

Engl 332—Creative Writing—3 cr. (3 and 0)
A continuation of Engl 331. *Prerequisite:* Engl 331 or permission of instructor.

Engl 333—The Structure of Fiction—3 cr. (3 and 0)
A study of the short story, the novella, and the novel from the writer's point of view. *Prerequisite:* Permission of instructor.

Engl 339—Science Fiction—3 cr. (3 and 0)
Readings in science fiction from the seventeenth century to the present, with special emphasis on writers since Verne and Wells. *Prerequisite:* Sophomore English.

Engl 351—Children's Literature—3 cr. (3 and 0)
Wide reading in prose and verse suitable for children in elementary grades. *Prerequisite:* Sophomore English.

Engl 352—Adolescent Literature—3 cr. (3 and 0)
Wide reading in prose and verse suitable for children in secondary schools. *Prerequisite:* Sophomore English.

Engl 362—Speech in the Elementary Classroom—3 cr. (3 and 0)
The development of oral communication skills in children and the use of speech improvement activities to motivate spontaneous, accurate self-expression. *Prerequisite:* Junior standing.

Engl 363—Speech for Teachers—3 cr. (3 and 0)
A performance course in the communication needs of the professional educator: listening, group discussion, speech and drama activities, conferences, using the media, and micro-teaching. *Prerequisite:* Engl 301, 305, or 308.

Engl 402—The English Language—3 cr. (3 and 0)
Studies in English usage and the historical development of the language. *Prerequisite:* Junior standing.

Engl 404—The Structure of Modern English—3 cr. (3 and 0)
Structural linguistic analysis; principles of phonology, morphology, and syntax as related to traditional, structural, and transformational grammars. Recommended for English teachers. *Prerequisite:* Junior standing.

Engl 405—Shakespeare—3 cr. (3 and 0)
An introduction to Shakespeare's plays through a study of the tragedies *Hamlet, Othello, King Lear, Macbeth, Anthony* and *Cleopatra,* and of the two tragic plays *Romeo and Juliet* and *Julius Caesar. Prerequisite:* Junior standing.

ENGL 406—SHAKESPEARE—3 cr. (3 and 0)
A selective study of Shakespeare's comedies and histories. *Prerequisite:* Junior standing.

ENGL 409—CHAUCER—3 cr. (3 and 0)
Chaucer as an artist; the "Prologue" for historical and linguistic orientation; "The Canterbury Tales," "House of Fame," "Parliament of Fowls," and "Troilus and Criseyde" as art forms. *Prerequisite:* Junior standing.

ENGL 410—MIDDLE ENGLISH LITERATURE—3 cr. (3 and 0)
Selected works written in English between 1100 and 1500, exclusive of Chaucer. *Prerequisite:* Junior standing.

ENGL 413—CLASSICAL DRAMA—3 cr. (3 and 0)
Selected readings in the dramatic literature of classical Greece and Rome. *Prerequisite:* Junior standing.

ENGL 416—MODERN DRAMA—3 cr. (3 and 0)
Principles and progress of drama from Ibsen to the present; analysis of representative plays; critical reports; discussion of trends in contemporary drama. *Prerequisite:* Junior standing.

ENGL 422—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
The Colonial Period to the Civil War, with emphasis on major authors. *Prerequisite:* Junior standing.

ENGL 423—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
From the Civil War to the early twentieth century, with emphasis on major authors. *Prerequisite:* Junior standing.

ENGL 424—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)
Twentieth century, with emphasis on major authors. (Not open to those who have passed Engl 438.) *Prerequisite:* Junior standing.

ENGL 425—THE ROMANTIC REVIVAL—3 cr. (3 and 0)
The eighteenth century forerunners of Romanticism; Wordsworth, Coleridge, Byron, Shelley, Keats. *Prerequisite:* Junior standing.

ENGL 427—VICTORIAN POETRY—3 cr. (3 and 0)
Extensive readings from the poets of the Victorian Age. *Prerequisite:* Junior standing.

ENGL 429—NINETEENTH CENTURY PROSE—3 cr. (3 and 0)
Readings in the fiction of the nineteenth century after Jane Austen and in the essays of the Romantic and Victorian periods. *Prerequisite:* Junior standing.

ENGL 431—THE RESTORATION AND EIGHTEENTH CENTURY—3 cr. (3 and 0)
Readings in Dryden, Swift, Pope, and Dr. Johnson. *Prerequisite:* Junior standing.

ENGL 435—SOUTHERN LITERATURE—3 cr. (3 and 0)
The intellectual and literary achievement of the South from 1607 to the present, with emphasis upon the writers of the nineteenth century. *Prerequisite:* Junior standing.

ENGL 436—MILTON AND HIS AGE—3 cr. (3 and 0)
The development of Milton's thought and art in relation to his times and to the writings of his contemporaries. *Prerequisite:* Junior standing.

ENGL 437—THE EIGHTEENTH CENTURY ENGLISH NOVEL—3 cr. (3 and 0)
A critical and historical study of the English novel from Defoe to Jane Austen. *Prerequisite:* Junior standing.

ENGL 438—TWENTIETH CENTURY POETRY—3 cr. (3 and 0)
The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. (Not open to those who have completed Engl 424.) *Prerequisite:* Junior standing.

ENGL 439—TWENTIETH CENTURY FICTION—3 cr. (3 and 0)
American and British novelists and short story writers of the twentieth century. *Prerequisite:* Junior standing.

ENGL 440—APPLIED LITERARY CRITICISM—3 cr. (3 and 0)
Major critical approaches to literature, in theory and practice, from Aristotle to the present. *Prerequisite:* Junior standing.

ENGL 443—SEVENTEENTH CENTURY POETRY AND PROSE—3 cr. (3 and 0)
A survey of British authors of the seventeenth century other than Shakespeare and Milton. *Prerequisite:* Junior standing.

ENGL 445—RENAISSANCE NONDRAMATIC LITERATURE—3 cr. (3 and 0)
Tudor and Elizabethan poetry, prose fiction, translations, essays, and criticism. *Prerequisite:* Junior standing.

ENGL 446—TUDOR-STUART DRAMA—3 cr. (3 and 0)
Selected readings in non-Shakespearean dramatic literature of the sixteenth and seventeenth centuries. *Prerequisite:* Junior standing.

ENGL 447—THE AMERICAN NOVEL—3 cr. (3 and 0)
A survey of the most significant forms and themes of the American novel from its beginnings to 1900. *Prerequisite:* Junior standing.

ENGL 461—STUDIES IN ENGLISH LITERATURE TO 1700—3 cr. (3 and 0)
Selected readings in English literature from the beginnings to 1700, with emphasis on social and intellectual backgrounds. *Prerequisite:* Junior standing.

ENGL 462—STUDIES IN ENGLISH LITERATURE SINCE 1700—3 cr. (3 and 0)
Selected readings in English literature from 1700 to the present, with emphasis on social and intellectual backgrounds. *Prerequisite:* Junior standing.

ENGL H470—SENIOR DIVISION HONORS ENGLISH—3 cr. (3 and 0)
An intensive study of a period, topic, genre, or figure. Papers, reports, reading list, examination. *Prerequisite:* Engl 203, 204 or H203, H204 and approval of the Honors Council. May be repeated by arrangement with the department.

ENGL 481—DIRECTED READING—1-3 cr. (1-3 and 0)
Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. May be repeated by arrangement with the department. *Prerequisite:* Junior standing, or Engl H203, H204, and invitation of the department.

ENGL 602—THE ENGLISH LANGUAGE—3 cr. (3 and 0)

ENGL 604—THE STRUCTURE OF MODERN ENGLISH—3 cr. (3 and 0)

ENGL 605—SHAKESPEARE—3 cr. (3 and 0)

ENGL 606—SHAKESPEARE—3 cr. (3 and 0)

ENGL 609—CHAUCER—3 cr. (3 and 0)

ENGL 610—MIDDLE ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 613—CLASSICAL DRAMA—3 cr. (3 and 0)

ENGL 616—MODERN DRAMA—3 cr. (3 and 0)

ENGL 622—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 623—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 624—A SURVEY OF AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 625—THE ROMANTIC REVIVAL—3 cr. (3 and 0)

ENGL 627—VICTORIAN POETRY—3 cr. (3 and 0)

ENGL 629—NINETEENTH CENTURY PROSE—3 cr. (3 and 0)

ENGL 631—THE RESTORATION AND EIGHTEENTH CENTURY—3 cr. (3 and 0)

ENGL 635—SOUTHERN LITERATURE—3 cr. (3 and 0)

ENGL 636—MILTON AND HIS AGE—3 cr. (3 and 0)

ENGL 637—THE EIGHTEENTH CENTURY ENGLISH NOVEL—3 cr. (3 and 0)

ENGL 638—TWENTIETH CENTURY POETRY—3 cr. (3 and 0)

ENGL 639—TWENTIETH CENTURY FICTION—3 cr. (3 and 0)

ENGL 640—APPLIED LITERARY CRITICISM—3 cr. (3 and 0)

ENGL 643—SEVENTEENTH CENTURY POETRY AND PROSE—3 cr. (3 and 0)

ENGL 645—RENAISSANCE NONDRAMATIC LITERATURE—3 cr. (3 and 0)

ENGL 646—TUDOR-STUART DRAMA—3 cr. (3 and 0)

ENGL 647—THE AMERICAN NOVEL—3 cr. (3 and 0)

ENGL 661—STUDIES IN ENGLISH LITERATURE TO 1700—3 cr. (3 and 0)

ENGL 662—STUDIES IN ENGLISH LITERATURE SINCE 1700—3 cr. (3 and 0)

ENGL 740—BLACK AMERICAN LITERATURE FOR TEACHERS—3 cr. (3 and 0)

ENGL 751—CHILDREN'S LITERATURE FOR TEACHERS—3 cr. (3 and 0)

ENGL 761—ENGLISH LITERATURE FOR TEACHERS I—3 cr. (3 and 0)

ENGL 762—ENGLISH LITERATURE FOR TEACHERS II—3 cr. (3 and 0)

ENGL 801—THE TEACHING OF ENGLISH—3 cr. (3 and 0)

ENGL 802—STUDIES IN MIDDLE ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 803—STUDIES IN RENAISSANCE ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 804—STUDIES IN NEOCLASSIC AND ROMANTIC LITERATURE—3 cr. (3 and 0)

ENGL 805—STUDIES IN VICTORIAN AND MODERN ENGLISH LITERATURE—3 cr. (3 and 0)

ENGL 810—STUDIES IN COLONIAL AND REVOLUTIONARY AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 811—STUDIES IN ROMANTIC AND REALISTIC AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 812—STUDIES IN MODERN AMERICAN LITERATURE—3 cr. (3 and 0)

ENGL 820—STUDIES IN THEORETICAL AND APPLIED LITERARY CRITICISM—3 cr. (3 and 0)

ENGL 830—STUDIES IN LINGUISTICS—3 cr. (3 and 0)

ENGL 840—STUDIES IN WORLD LITERATURE—3 cr. (3 and 0)

ENGL 881—DIRECTED READING—3 cr. (3 and 0)

ENGL 890—INTRODUCTION TO RESEARCH—1 cr. (1 and 0)

ENGL 891—RESEARCH—Credit to be arranged.

ENTOMOLOGY

Professors: T. R. ADKINS, JR., R. C. FOX, E. W. KING
Associate Professors: S. B. HAYS, *Head;* T. E. SKELTON
Assistant Professors: G. R. CARNER, R. F. NASH, R. NOBLET

ENT 200—INSECTS—2 cr. (2 and 0)
An introduction to insects; their various relationships with man, other animals and plants. The general nature of this course makes it beneficial to all students regardless of specialty.

ENT 301—GENERAL ENTOMOLOGY—3 cr. (2 and 3)
A general introduction to entomology with emphasis on anatomy, metamorphosis, and description of the most common insect species. Methods of control are introduced and current control practices are explained for some of the most important species.

ENT 307—FOREST ENTOMOLOGY—3 cr. (2 and 3) F
Insects of economic importance to forests, forest products and shade trees, and their role in the practice of good forest management as well as their significance in the natural environment.

ENT 308—APICULTURE—3 cr. (2 and 3)
A detailed study of the honey bee and its economic importance in pollination and honey production. Attention will be given to bee behavior, colony management, equipment, honey plant identification, and honey production and processing. *Prerequisite:* Zool 102, 104, and permission of instructor.

ENT 401—FIELD CROP AND STORED PRODUCT INSECTS—3 cr. (2 and 3)
Common insect pests of the following are studied: cotton, corn, small grains, legume field crops, tobacco, stored grain and seed. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

ENT 402—FRUIT, NUT, AND VEGETABLE INSECTS—3 cr. (2 and 3)
Common insect pests of the following are studied: peaches, apples, grapes, pecans, sweet corn, cole crops, cucurbits, potatoes, sweet potatoes, peas and beans. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

Ent 405—Insect Morphology—4 cr. (3 and 3) F
A study of insect structure in relation to function and of the variation of form in insects. *Prerequisite:* Ent 301.

Ent H405—Insect Morphology—4 cr. (3 and 3) F
Honors option for Ent 405; admission by special arrangement.

Ent 410—Insect Taxonomy—3 cr. (1 and 6)
The identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification; lecture material deals with necessary theoretical discussion of taxonomic features observed in the laboratory. *Prerequisite:* Zool 102, 104, Ent 301, Ent 405 desirable.

Ent 455—Medical and Veterinary Entomology—3 cr. (2 and 3) S
Insects and their arthropod relatives which are of considerable economic importance in their effect on man and animals.

Ent 458—Pest Control—3 cr. (2 and 3)
A detailed study of insect pests of structures, the household, lawn and ornamental plants. Identification of the pest, its damage, control methods and safety in handling insecticides will be emphasized.

Ent 461—Seminar—1 cr. (1 and 0) F
Students review the principal journals pertaining to insects and related animals; also review the lives and activities of prominent pioneer entomologists. *Prerequisite:* Zool 102, 104, Ent 301.

Ent 462—Seminar—1 cr. (1 and 0) S
Continuation of Ent 461.

Ent 468—Introduction to Research—2 cr. (1 and 3) S
Principles, developments and changes in research methods related to certain fields of biological and agricultural research. The students obtain practice in experimental techniques, scientific writing and the use and maintenance of various research instruments and equipment.

Ent 480—Insect Pathology—3 cr. (2 and 3)
The study of insect diseases including those caused by viruses, rickettsiae, bacteria, fungi, protozoa, and nematodes will be covered in this course. The effects of diseases on insect populations and the use of pathogens in insect control will also be considered in detail.

Ent 601—Field Crop and Stored Product Insects—3 cr. (2 and 3)

Ent 602—Fruit, Nut, and Vegetable Insects—3 cr. (2 and 3)

Ent 605—Insect Morphology—4 cr. (3 and 3)

Ent 610—Insect Taxonomy—3 cr. (1 and 6)

Ent 655—Medical and Veterinary Entomology—3 cr. (2 and 3)

Ent 658—Pest Control—3 cr. (2 and 3)

Ent 668—Introduction to Research—2 cr. (1 and 3)

Ent 680—Insect Pathology—3 cr. (2 and 3)

Ent 808—Taxonomy of Immature Insects—3 cr. (1 and 6)

Ent 809—Recent Advances in Entomology I—1 cr. (1 and 0)

Ent 810—Recent Advances in Entomology II—1 cr. (1 and 0)

Ent 856—Medical Entomology—3 cr. (2 and 3)

Ent 860—Principles of Insect Control—3 cr. (3 and 0)

Ent 861—Insect Toxicology—3 cr. (2 and 3)

Ent 863—Special Problems in Entomology—3-6 cr.

Ent 870—Advanced Insect Physiology—3 cr. (2 and 3)

Ent 891—Research—Credit to be arranged.

Ent 991—Doctoral Research—Credit to be arranged.

ENVIRONMENTAL HEALTH

Associate Professor: **R. F. Borgman, *Program Director***

EnH 471—Man and His Environment—2 cr. (2 and 0)
The interactions of man with his environment will be surveyed. Health factors such as urbanization, population growth, pathogens, insects and other vectors, ionizing radiation, and toxic chemical residues will be emphasized. The effects of air, water, food, and solid waste contacts will be considered. *Prerequisite:* Permission of instructor.

EnH 472—Environmental Planning and Control—2 cr. (2 and 0)
Application of planning and design to effective environmental control. Topics such as land use, water supply and treatment, wastewater treatment and disposal, and solid waste disposal will be considered from the standpoint of control. *Prerequisite:* Permission of instructor.

EnH 671—Man and His Environment—2 cr. (2 and 0)

EnH 672—Environmental Planning and Control—2 cr. (2 and 0)

EnH 893—Environmental Health Seminar I—1 cr. (1 and 0)

ENVIRONMENTAL SYSTEMS ENGINEERING

Professors: J. F. Andrews, *Head;* J. H. Austin, L. G. Rich

Associate Professors: A. R. Abernathy, B. C. Dysart

Assistant Professors: G. E. James, T. M. Keinath

Lecturer: G. M. McCallum

Adjunct Professors: D. W. Duttweiler, W. M. Sanders

ESE 401—Environmental Engineering—3 cr. (3 and 0)
An introduction to the field of environmental engineering. Topics to be covered include public health aspects of the environment, water supply and treatment, water pollution control, air pollution control, solid wastes collection and disposal, noise abatement, and radiological health. *Prerequisite:* Junior standing in engineering or permission of instructor.

ESE 402—Water and Waste Treatment Systems—3 cr. (3 and 0)
A study of the fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in

water and waste treatment. Both physiochemical and biological treatment techniques will be discussed. An introduction to the integration of unit operations and processes into water and waste treatment systems. *Prerequisite:* EM 320, E&CE 330, or permission of instructor.

ESE 403—WATER AND WASTE TRANSPORT SYSTEMS—3 cr. (3 and 0)
Analysis, design, and operation of continuous, man-made transport systems for water and wastewater. Introduction to continuous, natural transport systems for water and air and discrete, man-made transport systems for solid wastes. Application of systems engineering techniques such as network theory, transient analysis, mathematical modeling, simulation, and optimization will be stressed. *Prerequisite:* EM 320, E&CE 330, or permission of instructor.

ESE 443—ENVIRONMENTAL ENGINEERING CHEMISTRY I—2 cr. (2 and 0)
A study of those fundamental principles of physical and analytical chemistry that find application in the treatment of waters and wastewaters. Chemical thermodynamics, chemical kinetics, acid-base equilibria, solubility equilibria, complex equilibria, and electrochemistry, are several topics that are examined.

ESE 444—ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY I—2 cr. (0 and 6)
Demonstration of the principles discussed in ESE 443 and laboratory exercises in those analytical methods used in water quality control. Typical wet-chemical analytical techniques demonstrated are residue analysis, turbidity, color, alkalinity, acidity, pH, hardness, iron, manganese, dissolved oxygen, and biochemical oxygen demand. Moreover, several modern instrumental and electroanalytical techniques that are commonly incorporated in environmental water quality monitors are discussed and demonstrated in detail.

ESE 601—ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)

ESE 602—WATER AND WASTE TREATMENT SYSTEMS—3 cr. (3 and 0)

ESE 603—WATER AND WASTE TRANSPORT SYSTEMS—3 cr. (3 and 0)

ESE 643—ENVIRONMENTAL ENGINEERING CHEMISTRY I—2 cr. (2 and 0)

ESE 644—ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY I—2 cr. (0 and 6)

ESE 832—UNIT PROCESSES LABORATORY—1 cr. (0 and 3)

ESE 833—UNIT OPERATIONS LABORATORY—1 cr. (0 and 3)

ESE 842—SANITARY ENGINEERING PROCESSES—3 cr. (3 and 0)

ESE 843—UNIT OPERATIONS OF SANITARY ENGINEERING—3 cr. (3 and 0)

ESE 846—POLLUTION OF THE AQUATIC ENVIRONMENT—3 cr. (2 and 3)

ESE 848—ENVIRONMENTAL ENGINEERING CHEMISTRY II—2 cr. (2 and 0)

ESE 849—ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY II—2 cr. (1 and 3)

ESE 852—WATER AND WASTEWATER TREATMENT SYSTEM—3 cr. (2 and 3)

ESE 861—ENVIRONMENTAL SYSTEMS ENGINEERING SEMINAR—0-1 cr. (1 and 0)

ESE 862—ENVIRONMENTAL QUALITY CASE STUDY—1 cr. (0 and 3)

ESE 881—SPECIAL PROBLEMS—1-4 cr.

ESE 883—SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)

ESE 884—SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)

ESE 891—RESEARCH—1-6 cr.

ESE 991—DOCTORAL RESEARCH—Credit to be arranged.

EXPERIMENTAL STATISTICS

Professor: W. P. BYRD, *Chairman*

Associate Professors: W. E. JOHNSTON, J. S. LYTLE

Assistant Professor: J. R. HOLMAN

Ex ST 301—INTRODUCTORY STATISTICS—3 cr. (2 and 2) F, S, SS
Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. The role of statistics in interpreting research, and the general application of the methods are stressed.

Ex ST 462—STATISTICS APPLIED TO ECONOMICS—3 cr. (3 and 0) S
A continuation of Ex St 301 with emphasis on statistical methods used in the collection, analysis, presentation and interpretation of economic data. Special attention is given to time series analysis, the construction of index numbers and the designing of samples for surveys in the social science fields. *Prerequisite:* Ex St 301.

Ex ST 662—STATISTICS APPLIED TO ECONOMICS—3 cr. (3 and 0)

Ex ST 801—STATISTICAL METHODS—4 cr. (3 and 3)

Ex ST 803—REGRESSION AND LEAST SQUARES ANALYSIS—3 cr. (3 and 0)

Ex ST 804—SAMPLING—3 cr. (3 and 0)

Ex ST 805—DESIGN AND ANALYSIS OF EXPERIMENTS—3 cr. (3 and 0)

FLUID MECHANICS

The courses listed are offered by the faculties of the Departments of Chemical Engineering, Engineering Mechanics, and Mechanical Engineering for students majoring in those departments who desire an area of concentration in fluid mechanics. This integrated sequence provides the opportunity for in-depth penetration of this study area as well as breadth of application to such diverse fields of technology as: propulsion systems, water distribution systems, chemical systems, biological systems, and air and water pollution.

The 800 series courses will be offered on *fixed schedule,* odd number offered in fall and even number in spring. The 900 series are offered as needed.

FM 801—FOUNDATION OF FLUID MECHANICS—3 cr. (3 and 0)

FM 811—EXPERIMENTAL FLUID MECHANICS—3 cr. (2 and 3)

FM 812—THEORY OF INCOMPRESSIBLE IDEAL FLOW—3 cr. (3 and 0)

FM 814—TURBULENT BOUNDARY LAYER—3 cr. (3 and 0)

FM 815—NUMERICAL METHODS IN FLUID MECHANICS—3 cr. (3 and 0)

FM 816—FLOW IN OPEN CHANNELS—3 cr. (3 and 0)

FM 817—NON-NEWTONIAN FLOW—3 cr. (3 and 0)

FM 841—SEMINAR—1 cr. (1 and 0)

FM 901—APPLIED HYDRODYNAMICS—3 cr. (3 and 0)

FM 921—TWO-PHASE FLOW—3 cr. (3 and 0)

FM 931—FREE SURFACE FLOW—3 cr. (3 and 0)

FM 951—BIO-FLUID MECHANICS—3 cr. (3 and 0)

FOOD SCIENCE

Professors: J. H. MITCHELL, JR., W. P. WILLIAMS, *Head*
Assistant Professors: J. C. ACTON, J. J. JEN, M. G. JOHNSON

FD SC 212—MAN'S FOOD RESOURCES—2 cr. (2 and 0) S, '73 and alternate years.

Food material resources with reference to quality preservation, processing, and nutritional requirements. The role of science and technology in the modern food industry is emphasized. The need for food standards and grades is explained, and the functions of regulatory agencies are discussed. *Prerequisite:* Biol 101.

FD SC 305—DAIRY AND FOOD ENGINEERING—3 cr. (2 and 3) F, '72

A study of the basic engineering principles and their application to the dairy and food processing operations. The relationship between engineering principles and fundamentals of food processing is emphasized for the dairy and food technologist. Topics include material and energy balance, electricity and power, steam generation, refrigeration, transfer of heat, flow and mechanics of fluids, evaporation and distillation, strength of materials and kinetics of biological reactions.

FD SC 311—FOOD PROCESSING—3 cr. (3 and 0)
F, '73 and alternate years.

Principles of food handling and processing by refrigerated storage, freezing, canning, fermentation, sugar concentration, and food additives. *Prerequisite:* Organic chemistry and physics.

FD SC 312—FOOD PROCESSING—3 cr. (3 and 0)
S, '74 and alternate years.

Principles of dehydration. Unit processes and manufacturing methods used in the processing of cereal grains, dairy products, meats and fish, vegetable oils, beverages, and confectioneries. Importance of water supply and waste disposal in food manufacture. *Prerequisite:* Organic chemistry and physics.

FD SC 313—FOOD PROCESSING LABORATORY—1 cr. (0 and 3)
F, '73 and alternate years.

Laboratory exercises dealing with equipment and processes used in food manufacture. *Prerequisite:* Registration in Fd Sc 311.

Fd Sc 314—Food Processing Laboratory—1 cr. (0 and 3)
S, '74 and alternate years.
A continuation of Fd Sc 313. *Prerequisite:* Registration in Fd Sc 312.

Fd Sc 412—Food Quality Control—2 cr. (2 and 0) S, '73
A comprehensive treatment of the philosophy and organization of and the responsibility for food quality control function. Major emphasis is placed on principles, quality attributes, government and trade standards of identity and their development, acceptance sampling (inspection), recording and reporting, and production and inventory control.

Fd Sc 413—Biochemistry of Foods—2 cr. (2 and 0)
F, '73 and alternate years.
Biochemical and enzymatic phenomena in relation to the color, texture, flavor, and nutritive value of foods, changes in biochemical constituents as a result of food processing and storage. *Prerequisite:* Ch 310, Bioch 423, or permission of instructor.

Fd Sc 414—Food Quality Control Laboratory—2 cr. (1 and 3) S, '73
Fundamental aspects of sensory techniques employed in the quality evaluation of food products. A study of laboratory methods employed in product evaluation and grading of processed foods. A concept of quality is formed through examination of various grades of each food product. Actual practice in the selection and operation of taste panels illustrate their use in the industry.

Fd Sc 415—Human Nutrition—2 cr. (2 and 0)
F, '73 and alternate years.
Characteristics and functions of basic food nutrients and how they are affected by food processing, preservation and storage methods. Pathways for the conversion of nutrients into living tissue will be examined. *Prerequisite:* Ch 310, Bioch 423, or permission of instructor.

Fd Sc 416—Food Analysis—2 cr. (1 and 3)
S, '74 and alternate years.
Application of quantitative procedures to the analysis of food products. Procedures include solids, protein, carbohydrates, lipids, vitamins, fiber, pigments, and other components. *Prerequisite:* Quantitative analysis or permission of instructor.

Fd Sc 417—Seminar—1 cr. (1 and 0) F, '72
Literature research and oral presentation of current food science topics.

Fd Sc 418—Seminar—1 cr. (1 and 0) S, '73
Literature research and oral presentation of current food science topics.

Fd Sc 420—Special Topics in Food Science—1-3 cr. (1-3 and 0) S, '71
A comprehensive study of special topics in Food Science not covered in other courses. Special emphasis will be placed on independent investigations of contemporary developments.

Fd Sc 612—Food Quality Control—2 cr. (2 and 0)

Fd Sc 613—Biochemistry of Foods—2 cr. (2 and 0)

Fd Sc 614—Food Quality Control Laboratory—2 cr. (1 and 3)

Fd Sc 615—Human Nutrition—2 cr. (2 and 0)

Fd Sc 616—Food Analysis—2 cr. (1 and 3)

FORESTRY

Professors: R. M. Allen, *Head;* B. M. Cool, J. R. Warner

Associate Professors: N. B. Goebel, C. L. Lane, R. E. Schoenike, W. A. Shain, D. H. Van Lear

Assistant Professor: T. E. Wooten

Instructor: L. D. Reamer

Visiting Assistant Professor: J. R. Saucier

For 101—Introduction to Forestry—1 cr. (1 and 0) F

An informative sketch of forestry, forests, and forestry tasks of the nation; education in career opportunities of foresters.

For 102—Introduction to Forestry—1 cr. (1 and 0) S

A continuation of For 101.

For 205—Dendrology—4 cr. (3 and 3) F

Classification and identification of the principal forest trees of the United States, their geographical distribution, ecological requirements, and economic importance. Field identification of native trees, shrubs, woody vines, and of commonly planted exotics in the Piedmont and surrounding areas. *Prerequisite:* Bot 102.

For 206—Silvics—4 cr. (3 and 3) S

A study of the nature of forests and forest trees, how they grow, reproduce, and their relationships to the physical and biological environment. *Prerequisite:* Agron 202, Bot 102, For 205.

For 251—Forest Plants—2 cr. (Summer Camp)

Identification of principal native forestry understory plants by vegetative and floral characteristics; their site requirements and forest-type associations with emphasis on successional patterns; and their value for man and wildlife. The preparation of a field herbarium is required of all students. *Prerequisite:* Bot 102, For 205.

For 252—Forest Engineering—2 cr. (Summer Camp) SS

Field and drafting practice in mapping, traversing boundaries, and road location; use of surveying equipment and techniques. *Prerequisite:* EG 105, CE 201.

For 253—Forest Mensuration—4 cr. (Summer Camp)

Practical application of field techniques including timber cruising, measuring tree heights and volumes, constructing volume tables and boundary line surveys. *Prerequisite:* CE 201, EG 105, For 205.

For 254—Forest Products—1 cr. (Summer Camp)

A tour of the forest products industry of South Carolina with an emphasis on those products and processes of some distinction or special interest.

For 302—Forest Mensuration—3 cr. (2 and 3) S

A practical application of statistical and mensurational techniques in forest management. *Prerequisite:* Ex St 301 and Forestry Summer Camp.

For 304—Forest Economics—3 cr. (3 and 0) S
Economic problems and principles involved in the utilization of forest land and timber and in the distribution of forest products; cost analysis of integrated forest operations. *Prerequisite:* Econ 201.

For 305—Elements of Forestry—2 cr. (2 and 0) F, S
A compendium of forestry subjects providing a broad view of the forest environment as it relates to ecology, management and utilization of forests, especially those of South Carolina. *Prerequisite:* Bot 102 or permission of instructor. Not open to forestry majors.

For 306—Wood and Wood Fiber Identification—2 cr. (1 and 3) S
Macroscopic and microscopic identification, properties, and uses of selected economically significant timbers. *Prerequisite:* Bot 102, Ch 102, or permission of instructor.

For 307—Elements of Forestry Laboratory—1 cr. (0 and 3) F, S
Field and laboratory exercises in the fundamentals of forest land management considered in For 305. *Prerequisite:* Registration in For 305.

For 308—Aerial Photographs in Forestry—3 cr. (2 and 3) F
An introduction to photographic measurements, aerial photo-interpretations, mapping, and timber estimating. *Prerequisite:* CE 201, Forestry Summer Camp, or permission of instructor.

For 310—Silviculture—4 cr. (3 and 3) S
Theory and practice of establishing, maintaining, and harvesting forest stands in accordance with ecological and economic principles. *Prerequisite:* For 206 and Forestry Summer Camp.

For 401—Logging and Milling—3 cr. (2 and 3) S
Logging and milling methods and costs with major emphasis on survey of methods and equipment. *Prerequisite:* Senior standing or permission of instructor.

For 403—Forest Soils Seminar—1 cr. (1 and 0) F
A study of forest soil characteristics with respect to site evaluation, forest fertilization, planting problems, watershed management, tree-soil-microorganism interactions, and trafficability. *Prerequisite:* Junior standing or permission of instructor.

For 409—Multiple-Use Forestry—3 cr. (3 and 0) F
A study of the demands placed on forests for a variety of products and uses, and how these can and must be reconciled in planning the management of each forest. *Prerequisite:* Senior standing or permission of instructor.

For 411—Harvesting Forest Products—3 cr. (2 and 3) S
An application of engineering and cost analysis techniques to the evaluation of the forest transport system and various harvesting situations. *Prerequisite:* For 401 or permission of instructor.

For 412—Forest Protection—2 cr. (2 and 0) S
Prevention and suppression of forest fires; their effect upon the environment and people; factors affecting fire behavior; and use of fire in resource management. *Prerequisite:* Senior standing or permission of instructor.

For 414—Management Plans—1 cr. (0 and 3) S
Analysis of factors entering into forest working plans of several forestry organizations; preparation of a preliminary management plan of a sample area. *Prerequisite:* For 417.

For 416—Forest Policy and Administration—2 cr. (2 and 0) S
Development of public and private forest policy in the United States; administrative and executive tasks in forestry; principles of organization, personnel management, budgeting, and decision making. *Prerequisite:* For 304 or permission of instructor.

For 417—Forest Management and Regulation—4 cr. (3 and 3) F
Correlation of production factors and yields of forests; regulation of cuts and growing stock in sustained yield management. *Prerequisite:* Forestry Summer Camp, For 304, 310.

For 418—Forest Valuation—3 cr. (3 and 0) S
Capital investments in forestry and the returns derivable from them; valuation of land, timber, and other resources associated with forestry; appraisal of damage and stumpage values. *Prerequisite:* For 304.

For 420—Forest Products—2 cr. (2 and 0) F
Primary forest products other than lumber; i.e., poles and piles, railroad ties, veneers and plywoods, wood furniture, shingles, containers, secondary wood products; chemically derived products from wood including pulp and paper, distillation products, wood hydrolysis; miscellaneous and minor forest products. *Prerequisite:* For 205, Phys 207, Forestry Summer Camp; Senior standing or permission of instructor.

For 421—Wood Properties I—3 cr. (2 and 3) F
The formation of wood in forest trees; gross and minute characteristics of wood; defects in wood; variability in wood. *Prerequisite:* Bot 102, For 306, or permission of instructor.

For 422—Wood Properties II—3 cr. (2 and 3) S
Wood in relation to moisture, heat, sound, light, and electricity; mechanical properties of wood; standard testing procedures for wood. *Prerequisite:* For 306 or permission of instructor.

For 423—Lectures in Forestry—2-4 cr. (2-4 and 0-3)
Lectures in various fields of forestry delivered by the holders of the Belle W. Baruch Visiting Professorship in Forestry.

For 424—Forest Genetics and Tree Breeding—3 cr. (3 and 0) S
History of genetics and breeding in forestry and its relation to silviculture; natural variation, hybridization and inheritance in forest trees; tree breeding objectives and methods. *Prerequisite:* Gen 302 or equivalent, and permission of instructor.

For 426—A Survey of Forest Policy—2 cr. (2 and 0) S
Development of public and private forest policy in the United States; administrative and executive tasks in forestry; principles of organization, personnel management, and budget. *Prerequisite:* Senior standing. Not open to Forestry majors.

For 601—Logging and Milling—3 cr. (2 and 3)

For 602—Forest Mensuration—3 cr. (2 and 3)

For 604—Forest Economics—3 cr. (3 and 0)

For 606—Wood and Wood Fiber Identification—2 cr. (1 and 3)

For 608—Aerial Photographs in Forestry—3 cr. (2 and 3)

For 609—Multiple-Use Forestry—3 cr. (3 and 0)

For 610—Silviculture—4 cr. (3 and 3)

For 611—Harvesting Forest Products—3 cr. (2 and 3)

For 612—Forest Protection—2 cr. (2 and 0)

For 614—Management Plans—1 cr. (0 and 3)

For 616—Forest Policy and Administration—2 cr. (2 and 0)

For 617—Forest Management and Regulation—4 cr. (3 and 3)

For 618—Forest Valuation—3 cr. (3 and 0)

For 620—Forest Products—2 cr. (2 and 0)

For 621—Wood Properties I—3 cr. (2 and 3)

For 622—Wood Properties II—3 cr. (2 and 3)

For 623—Lectures in Forestry—2-4 cr. (2-4 and 0-3)

For 624—Forest Genetics and Tree Breeding—3 cr. (3 and 0)

For 801—Data Processing in Forestry Problems—3 cr. (2 and 3)

For 802—Advanced Mensuration—3 cr. (2 and 3)

For 803—Photo-Interpretation—3 cr. (2 and 3)

For 804—Advanced Forest Economics—3 cr. (2 and 3)

For 805—Cost Studies in Harvesting and Processing—3 cr. (2 and 3)

For 807—Special Problems in Forestry—Credit to be arranged.

For 891—Research—Credit to be arranged.

FRENCH

Professor: H. E. Stewart

Associate Professor: J. A. Dean

Assistant Professors: D. Y. Brannock, R. R. McGregor, Jr., J. A. McNatt, J. B. Macy

Instructors: D. J. Calvez, M. A. Kirsch, Germaine M. Lafitte, H. A. Lewis, G. A. Strader

Fr 101—Elementary French—4 cr. (3 and 1)

A course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr H101—Elementary French—4 cr. (3 and 1)
Honors section of Fr 101; admission by invitation.

Fr 102—Elementary French—4 cr. (3 and 1)
A continuation of Fr 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

Fr H102—Elementary French—4 cr. (3 and 1)
Honors section of Fr 102; admission by invitation.

Fr 151—French for Graduate Students—3 cr. (3 and 0)
An intensive program for graduate students preparing to take the reading examination in French. Some previous study of the language is helpful but not essential.

Fr 152—French Readings for Graduate Students—3 cr. (3 and 0)
A continuation of Fr 151 with increasing emphasis upon reading comprehension and vocabulary development in the student's area of interest. *Prerequisite:* Fr 151, one year of college French, or departmental permission.

Fr 201—Intermediate French—3 cr. (3 and 0)
Attention to grammar, with conversation, composition and dictation continued from Fr 102, and the beginning of more serious reading of French prose in short stories or novels.

Fr H201—Intermediate French—3 cr. (3 and 0)
Honors section of Fr 201; admission by invitation.

Fr 202—Intermediate French—3 cr. (3 and 0)
While attention is paid to writing and speaking French, more stress is laid on the rapid reading of more difficult French prose than in the earlier courses. *Prerequisite:* Fr 201.

Fr H202—Intermediate French—3 cr. (3 and 0)
Honors section of Fr 202; admission by invitation.

Fr 303—Survey of French Literature I—3 cr. (3 and 0)
Literary movements and authors from the beginnings to the eighteenth century. Required of French majors. *Prerequisite:* Fr 201, 202.

Fr 304—Survey of French Literature II—3 cr. (3 and 0)
Literary movements and authors of the nineteenth and twentieth centuries. Required of French majors. *Prerequisite:* Fr 201, 202.

Fr 305—Conversational French—3 cr. (3 and 0)
Practice in the spoken language, with stress on vocabulary building, pronunciation, intonation, and comprehension; written work to increase accuracy. Assignments in the language laboratory. Required of French majors. *Prerequisite:* Fr 201.

Fr 306—Advanced Conversation with Composition—3 cr. (3 and 0)
A continuation of Fr 305, with additional emphasis on written composition. *Prerequisite:* Fr 305.

Fr 307—French Civilization—3 cr. (3 and 0)
A study of the significant aspects of the culture of France from its origins to the present. *Prerequisite:* Fr 202 or approval of department.

FR 308—CONTEMPORARY FRENCH CULTURE—3 cr. (3 and 0)

A study of contemporary ideas, opinions and events through magazines, newspapers, scholarly journals of individual interest and essays of national and international import. Class discussions; oral and written reports. *Prerequisite:* Fr 202 or approval of department.

FR 309—INTRODUCTION TO FRENCH PHONETICS—3 cr. (3 and 0)

A study of the fundamental principles of the pronunciation of French through the use of the International Phonetic Alphabet and recordings. *Prerequisite:* Fr 201 or equivalent.

FR 403—TWENTIETH CENTURY PROSE—3 cr. (3 and 0)

The outstanding authors of the first half of the twentieth century: Proust, Gide, Mauriac, Saint-Exupéry, Sartre, Camus, and others. Reading of selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 404—TWENTIETH CENTURY DRAMA—3 cr. (3 and 0)

The French theater since 1900, with emphasis on the period after 1930. Readings, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 405—NINETEENTH CENTURY FRENCH ROMANTICISM—3 cr. (3 and 0)

The Romantic movement as expressed in the works of Chateaubriand, Hugo, Merimée, Vigny, Stendhal, Sand, and others. Readings, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 406—NINETEENTH CENTURY FRENCH REALISM—3 cr. (3 and 0)

Realism as expressed in the works of Balzac, Flaubert, Daudet, Maupassant, Zola, and others. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 407—EIGHTEENTH CENTURY FRENCH LITERATURE—3 cr. (3 and 0)

The principal literary figures of the eighteenth century, with particular emphasis on Voltaire and Rousseau. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 408—SEVENTEENTH CENTURY FRENCH DRAMA—3 cr. (3 and 0)

The French classical drama, with emphasis on Corneille, Racine, and Molière. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 409—ADVANCED GRAMMAR AND COMPOSITION—3 cr. (3 and 0)

An intensive study of syntax and stylistics through composition and translations. *Prerequisite:* Senior standing or permission.

FR 498—INDEPENDENT STUDY—1-3 cr. (1-3 and 0)

Independent in-depth study of selected topics in French literature. *Prerequisite:* Permission of the Head of the Department of Languages. This course is to be offered only when requests are received for worthy study projects that meet special student needs and interests.

GENETICS

Professor: C. M. JONES
Associate Professor: W. D. GRAHAM
Assistant Professor: J. D. MAXWELL

GEN 301—GENETICS—3 cr. (3 and 0) F

An introduction to the basic principles of genetics and the relationship of these principles to man. To include deleterious genes, chromosome abnormalities, and mutations as these affect the human race; sex-linked, sex-influenced and sex-limited traits; and genetic predictions and population genetics in relation to society. Will not substitute for Gen 302.

GEN 302—GENETICS—4 cr. (3 and 3) F, S, SS

A general coverage of the basic principles of genetics. Examples illustrating the fundamentals of heredity and variation are given for plants and animals, including man. *Prerequisite:* Biol 101, Bot 102, 104, and Zool 102, 104, or consent of instructor.

GEN 451—GENETICS—3 cr. (3 and 0) S

Methods and concepts in classical and modern genetics. Topics will include advanced studies of linkage; variations in chromosome number and structure; natural and induced mutations; extranuclear inheritance; experimental evolution; population, biochemical and medical genetics. Principles will be illustrated by examples from plants, animals (including man), and microorganisms. *Prerequisite:* Gen 302.

GEN 602—GENETICS—4 cr. (3 and 3)

GEN 651—GENETICS—3 cr. (3 and 0)

GEN 801—CYTOGENETICS—3 cr. (2 and 3)

GEOGRAPHY

GEOG 201—INTRODUCTION TO GEOGRAPHY—3 cr. (3 and 0)

An introduction to the study of geography, including maps, the physical elements of the natural environment and their distribution, and world cultural patterns.

GEOG 301—ECONOMIC GEOGRAPHY—3 cr. (3 and 0)

The geographic conditions fundamental to the world's resources—agricultural, mineral, commercial and industrial, and the conditions which affect the utilization, marketing, consumption and strategic significance of these resources.

GEOG 302—POLITICAL GEOGRAPHY—3 cr. (3 and 0)

The geographic basis for and the geographic problems of the modern state; the relevance of geographical patterns to international affairs. *Prerequisite:* Junior standing or permission of instructor.

GEOLOGY

Associate Professors: P. K. Birkhead, V. S. Griffin, Jr., G. M. Haselton, R. D. Hatcher, Jr.

Assistant Professor: D. S. Snipes

Geol 201—Physical Geology—4 cr. (3 and 3)

A study of the minerals and rocks which compose the earth's crust, their origins and transformations. Emphasis is placed upon geological processes, both internal and external, by which changes are produced on or in the earth. Laboratory instruction is provided in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results.

Geol 202—Historical Geology—4 cr. (3 and 3)

Evolution, both organic and inorganic, is traced from the beginning of the record up through time to the present. Laboratory instruction and field trips provide practice in the identification and study of plants and animals which have left their record as fossils in the rocks of the earth's crust. Emphasis is placed upon geologic structures and the interpretation of geologic maps. *Prerequisite:* Geol 201.

Geol 219—Geology for Foresters—3 cr. (3 and 0)

A study of materials of the earth's crust, processes of their origin and change; landforms, processes of their formation and destruction. Demonstration of materials is fully incorporated into lectures. Limited to students majoring in forestry or permission of instructor.

Geol 306—Mineralogy—3 cr. (2 and 3)

The student gains a working knowledge of crystallography and a comprehensive knowledge of determinative mineralogy. Identification of the minerals is based on their physical and chemical properties. *Prerequisite:* Geol 201 or 406.

Geol 309—Petrology—3 cr. (2 and 3)

The genesis, evolution, and classification of rocks through lectures, laboratory exercises, and field trips. The occurrences, chemical relationships, and distribution of rock types are emphasized. *Prerequisite:* Geol 306.

Geol 310—Optical Mineralogy—3 cr. (2 and 2)

The purpose of this course is to enable the student to identify minerals under the microscope on the basis of their optical properties. *Prerequisite:* Geol 306.

Geol 313—Stratigraphy and Sedimentation—3 cr. (3 and 0)

The process by which sediments are eroded, transported, and deposited (sedimentation), with major emphasis on relationships of the areal and time distribution of stratified rocks and their historical significances (stratigraphy). *Prerequisite:* Geol 201 or 406.

Geol 400—Environmental Geology—3 cr. (3 and 0)

A discussion-oriented introductory course requiring no previous geologic background involving the study of the relationships of man to his physical surroundings and the problems that result from upsetting the established equilibria of geologic systems. Introduction to geologic materials, systems and processes. Environmental impact of highways, cities, dams and other earthworks; mining techniques and various types of waste products on streams, the oceans, groundwater and other geologic systems. Man's role as a geologic agent, environmental conservation and management. Use of geologic maps and other geologic tools in resource and land-use planning.

GEOL 402—STRUCTURAL GEOLOGY—3 cr. (2 and 2)
The diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. *Prerequisite:* Geol 201 or 406.

GEOL 403—INVERTEBRATE PALEONTOLOGY—3 cr. (2 and 3)
A study of life of past geologic ages, as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. *Prerequisite:* Geol 201 or permission of instructor.

GEOL 404—ECONOMIC GEOLOGY—3 cr. (3 and 0)
This course concerns the description and classification of ore deposits and commercial nonmetallic mineral deposits. The origin of mineral deposits and their occurrence is emphasized. Problem studies and field trips to nearby mines and quarries. *Prerequisite:* Geol 306

GEOL 405—GEOMORPHOLOGY—4 cr. (3 and 3)
A study of the surface features of the earth—their form, nature, origin, development, and the change they are undergoing. *Prerequisite:* Geol 201, 202, or 406, or permission of instructor.

GEOL 406—ENGINEERING GEOLOGY—3 cr. (2 and 3)
This course is similar to Geol 201 except that progress is faster and emphasis is on the relationship of geology to engineering.

GEOL 407—QUATERNARY GEOLOGY—3 cr. (2 and 2)
Early concepts about glaciation. Types and distribution of glaciers today and during their maximum extent. Glacial erosion, transportation and ice-sculptured terrain features. Study of Quaternary Sediments and their chronology. Drainage changes, sea level fluctuations and crustal deformation. Detailed study of specific areas as time permits. Field trips.

GEOL 408—GEOHYDROLOGY—3 cr. (3 and 0)
Study of the hydrologic cycle, aquifer characteristics, theory of ground water movement, mechanics of well flow, experimental methods, and subsurface mapping. *Prerequisite:* Geol 201, 202, 406.

GEOL 411—RESEARCH PROBLEMS—3 cr. (0 and 9)
A field, laboratory, or library study of an approved topic in geology. The topic would be one not normally covered in formal course offering, but may be an extension of a course. *Prerequisite:* Senior standing in geology or approval of the department head.

GEOL 412—RESEARCH PROBLEMS—3 cr. (0 and 9)
A continuation of Geol 411.

GEOL 600—ENVIRONMENTAL GEOLOGY—3 cr. (3 and 0)

GEOL 602—STRUCTURAL GEOLOGY—3 cr. (2 and 2)

GEOL 603—INVERTEBRATE PALEONTOLOGY—3 cr. (2 and 3)

GEOL 604—ECONOMIC GEOLOGY—3 cr. (3 and 0)

GEOL 605—GEOMORPHOLOGY—4 cr. (3 and 3)

GEOL 606—MINERALOGY—3 cr. (2 and 3)

GEOL 607—QUATERNARY GEOLOGY—3 cr. (2 and 2)

GEOL 608—GEOHYDROLOGY—3 cr. (3 and 0)

GEOL 609—PETROLOGY—3 cr. (2 and 3)

GEOL 610—OPTICAL MINERALOGY—3 cr. (2 and 2)

GEOL 611—RESEARCH PROBLEMS—1-3 cr. (0 and 3-9)

GEOL 613—STRATIGRAPHY AND SEDIMENTATION—3 cr. (3 and 0)

GEOL 700—EARTH SCIENCE I—3 cr. (2 and 3)

GEOL 750—EARTH SCIENCE II—3 cr. (2 and 3)

GERMAN

Associate Professor: PATRICIA W. WANNAMAKER

Instructors: E. P. ARNOLD, H. L. LAWS, JR.

Lecturer: GEORGIA A. WILLIAMS

GER 101—ELEMENTARY GERMAN—4 cr. (3 and 1)
A course for beginners in which, through conversation, composition and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

GER H101—ELEMENTARY GERMAN—4 cr. (3 and 1)
Honors section of Ger 101; admission by invitation.

GER 102—ELEMENTARY GERMAN—4 cr. (3 and 1)
A continuation of Ger 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

GER H102—ELEMENTARY GERMAN—4 cr. (3 and 1)
Honors section of Ger 102; admission by invitation.

GER 151—GERMAN FOR GRADUATE STUDENTS—3 cr. (3 and 0)
An intensive program for graduate students preparing to take the reading examination in German.

GER 152—GERMAN READINGS FOR GRADUATE STUDENTS—3 cr. (3 and 0)
A continuation of Ger 151 with increasing emphasis upon reading comprehension and vocabulary development in the student's area of interest. *Prerequisite:* Ger 151, one year of college German, or departmental permission.

GER 201—INTERMEDIATE GERMAN—3 cr. (3 and 0)
A short review of grammar, with conversation, composition and dictation continued from Ger 102, and the beginning of more serious reading of German prose in short stories or novels.

GER H201—INTERMEDIATE GERMAN—3 cr. (3 and 0)
Honors section of Ger 201; admission by invitation.

Ger 202—Intermediate German—3 cr. (3 and 0)
While attention is paid to writing and speaking German, more stress is laid on the rapid reading of more difficult German prose than in the earlier courses. *Prerequisite:* Ger 201.

Ger H202—Intermediate German—3 cr. (3 and 0)
Honors section of Ger 202; admission by invitation.

Ger 251—Scientific German—3 cr. (3 and 0)
An alternate course to Ger 202; readings in general science and some review of grammar and syntax. *Prerequisite:* Ger 201.

Ger 303—Survey of German Literature I—3 cr. (3 and 0)
Chief authors and works from the Hildebrandslied through the Aufklärung. Required of German majors. *Prerequisite:* Ger 201, 202.

Ger 304—Survey of German Literature II—3 cr. (3 and 0)
Literary movements and works from Heine through Brecht. Required of German majors. *Prerequisite:* Ger 201, 202.

Ger 305—Conversational German—3 cr. (3 and 0)
Practice in the spoken language, with emphasis on vocabulary, pronunciation, and comprehension; written exercises for accuracy; assignments in the language laboratory. Required of German majors. *Prerequisite:* Ger 201.

Ger 306—Advanced Conversation with Composition—3 cr. (3 and 0)
Continuation of Ger 305 with additional emphasis on written composition. *Prerequisite:* Ger 305.

Ger 307—Contemporary German Culture I—3 cr. (3 and 0)
A study of significant aspects of the contemporary culture of Germany through readings in current German periodicals on a wide variety of subjects: art, music, literature, economics, travel and human interest topics. *Prerequisite:* Ger 202, or 251, or approval of department.

Ger 308—Contemporary German Culture II—3 cr. (3 and 0)
A continuation of Ger 307. *Prerequisite:* Ger 202, or 251, or approval of department.

Ger 403—Nineteenth Century German Literature—3 cr. (3 and 0)
Selected works of Heine, Hebbel, Grillparzer, Keller, Meyer, Hauptmann, Schnitzler, and Hofmannsthal. Readings, discussions, and reports. *Prerequisite:* Ger 303 or 304.

Ger 404—Twentieth Century German Literature—3 cr. (3 and 0)
Selected works from authors of the twentieth century. *Prerequisite:* Ger 303 or 304.

Ger 405—The Age of Goethe—3 cr. (3 and 0)
The development of German literature during Goethe's lifetime, 1749-1832; Aufklärung, Sturm und Drang, Klassiq, Romantik. *Prerequisite:* Ger 303 or 304.

Ger 406—Faust—3 cr. (3 and 0)
An intensive reading of Goethe's masterpiece accompanied by extensive critical research. *Prerequisite:* Ger 303 or 304.

Ger 498—Independent Study—1-3 cr. (1-3 and 0)
Independent in-depth study of selected topics in German literature. *Prerequisite:* Permission of Head of the Department of Languages.

HISTORY

Professors: C. W. Bolen, R. S. Lambert, E. M. Lander, Jr.

Assistant Professors: H. D. Adams, J. L. Arbena, J. W. Barnhill, Ruby S. Davis, C. A. Grubb, Patricia K. Hill, R. P. Leemhuis, Rameth R. Owens, J. V. Reel, Jr., R. L. Saunders, Jr., W. F. Steirer, Jr., A. Viglione

Instructors: Bettina K. Beer, J. R. Beer, C. M. Joekel, II, J. Y. LeBourgeois, A. D. McClare,* W. L. Pippin, Jr., J. E. Sargent, D. S. Trask, T. M. Verich

Hist 101—American History—3 cr. (3 and 0)
The political, economic and social development of the American people from the period of discovery to the end of Reconstruction.

Hist H101—American History—3 cr. (3 and 0)
Same as Hist 101 except that this honors section is open to students only by invitation.

Hist 102—American History—3 cr. (3 and 0)
The political, economic and social development of the American people from the end of Reconstruction to the present.

Hist H102—American History—3 cr. (3 and 0)
Continuation of Hist H101.

Hist 171—Western Civilization—3 cr. (3 and 0)
The political, economic, and social movements of Western Civilization from ancient times to A.D. 900.

Hist 172—Western Civilization—3 cr. (3 and 0)
The political, economic and social movements of Western Civilization from A.D. 900 to 1715.

Hist H172—Western Civilization—3 cr. (3 and 0)
The political, economic and social movements of Western Civilization from A.D. 900 to 1715.

Hist 173—Western Civilization—3 cr. (3 and 0)
The political, economic, and social movements of Western Civilization from 1715 to the present.

Hist H173—Western Civilization—3 cr. (3 and 0)
The political, economic and social movements of Western Civilization from 1715 to the present.

Hist 306—American Economic Development—3 cr. (3 and 0)
The economic development of the United States from Colonial to recent times, emphasizing the institutional development of agriculture, banking, business and labor, and government regulation and policy. *Prerequisite:* Hist 101, 102.

Hist 307—Recent U.S. Diplomatic History—3 cr. (3 and 0)
The history of American foreign policy from the late nineteenth century to the present, showing the rise of America's world interests and gradual involve-

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* On leave.

ment in global affairs. Emphasis is placed on the role of public opinion in foreign policy. *Prerequisite:* Hist 101, 102.

HIST 313—HISTORY OF SOUTH CAROLINA—3 cr. (3 and 0)
The political, economic and social development of South Carolina from 1670 up to the present. *Prerequisite:* Junior standing.

HIST 314—HISTORY OF THE SOUTH—3 cr. (3 and 0)
Origins and development of political, economic, and cultural institutions of the South from the Colonial period to the present; and the role of the South in the nation's development. (Formerly Hist 403.)

HIST 315—BLACK HISTORY IN AMERICA—3 cr. (3 and 0)
This course is an effort to define and understand the relationship of Black Americans with White Americans within American society after 1619. *Prerequisite:* Permission of instructor.

HIST 331—PRE-MODERN HISTORY OF EAST ASIA—3 cr. (3 and 0)
A survey of the history of China and Japan from earliest times to the arrival of Europeans in the sixteenth century.

HIST 332—MODERNIZATION OF EAST ASIA—3 cr. (3 and 0)
A survey of the history of China and Japan from the sixteenth century to the present, with emphasis on the impact of Western culture.

HIST 340—INDIGENOUS AND COLONIAL LATIN AMERICA—3 cr. (3 and 0)
An introduction to the geography of the region; structure and accomplishments of pre-Columbian societies; Iberian background to overseas expansion; conquest and settlement of the New World; political, economic, and social patterns in the Colonial era leading to the Wars of Independence. *Prerequisite:* Junior standing or permission of instructor.

HIST 341—MEXICO, CENTRAL AMERICA, AND THE CARIBBEAN SINCE 1800—3 cr. (3 and 0)
An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 342—SOUTH AMERICA SINCE 1800—3 cr. (3 and 0)
An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 361—HISTORY OF ENGLAND TO 1603—3 cr. (3 and 0)
The history of England to 1603. *Prerequisite:* Junior standing.

HIST 363—HISTORY OF ENGLAND SINCE 1603—3 cr. (3 and 0)
A continuation of History 361. *Prerequisite:* Junior standing.

HIST 371—ANCIENT CIVILIZATION—3 cr. (3 and 0)
A survey of the history of the Near East, Greece, and Rome to A.D. 476. *Prerequisite:* Hist 171, 172. (Formerly Hist 310.)

Hist 385—History of Russia to 1905—3 cr. (3 and 0)
A survey of Russian history from earliest times to 1905, emphasizing Kievan and Appanage Russia, the rise of the Moscow state, and Imperial Russia. *Prerequisite:* Junior standing.

Hist 386—History of Russia Since 1905—3 cr. (3 and 0)
Continuation of Hist 385. *Prerequisite:* Junior standing.

Hist 410—History of Colonial America—3 cr. (3 and 0)
The development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards, and the philosophy of, the American revolution. *Prerequisite:* Hist 101, 102.

Hist 411—United States, 1783-1850—3 cr. (3 and 0)
The formation and growing pains of the new nation through the Federal and Middle periods of its history, with emphasis on economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism. *Prerequisite:* Hist 101, 102.

Hist 412—United States, 1850-1900—3 cr. (3 and 0)
A course dealing with the background causes of developments during, and broad problems after, the Civil War in American history. *Prerequisite:* Hist 101, 102.

Hist 413—United States History, 1890-1933—3 cr. (3 and 0)
Emphasis will be placed on the Populist and Progressive movements, the rise of imperialism, American participation in World War I, the Republican era of the 1920's, and the coming of the Great Depression. *Prerequisite:* Hist 101, 102.

Hist 414—The United States Since 1933—3 cr. (3 and 0)
Particular emphasis will be given to the Great Depression, World War II, the Cold War, and domestic developments in the 1950's and 1960's. *Prerequisite:* Hist 101, 102.

Hist 441—Comparative History of the Americas—3 cr. (3 and 0)
An examination of the concept of a unique Western Hemisphere identity through a comparative analysis of common and divergent historical institutions and experiences. Selected topics to be considered will be drawn from the following: conquest and colonization, slavery and race relations, frontiers, land patterns, industrialization and urbanization, and twentieth century reform movements. *Prerequisite:* Hist 101, 102, and one of the following: Hist 340, 341, 342.

Hist 473—Medieval History—3 cr. (3 and 0)
A survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life. *Prerequisite:* Hist 172 or permission.

Hist 475—The Renaissance—3 cr. (3 and 0)
An examination of the transitional period of European civilization (ca. 1300-1500) with emphasis on institutional, cultural, and intellectual developments. *Prerequisite:* Hist 172 or permission.

HIST 476—EARLY MODERN EUROPE—3 cr. (3 and 0)
The evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion, and growth of nation-states. The study will include intellectual advances and the beginnings of European expansion overseas. *Prerequisite:* Hist 172 or permission.

HIST 477—ABSOLUTISM AND THE AGE OF REASON—3 cr. (3 and 0)
A study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the question of French hegemony, and the synthesis of the eighteenth century Enlightenment. *Prerequisite:* Hist 172 or permission.

HIST 479—EUROPE, 1789-1850—3 cr. (3 and 0)
A history of Europe from the outbreak of the French Revolutions through the Revolutions of 1848, with emphasis on the conflict between the forces of change and those of conservatism within the states and in Europe in general. (Formerly Hist 356.) *Prerequisite:* Hist 173 or permission.

HIST 480—EUROPE, 1850-1914—3 cr. (3 and 0)
A history of Europe from the mid-nineteenth century to the outbreak of the First World War, with emphasis on the social, economic and political development of the European states and the forces of nationalism, imperialism, and liberalism. (Formerly Hist 357.) *Prerequisite:* Hist 173 or permission.

HIST 481—NINETEENTH CENTURY EUROPEAN DIPLOMACY, 1815-1914—3 cr. (3 and 0)
A study of nineteenth century European diplomacy from the Congress of Vienna to the outbreak of the First World War, with emphasis on the functioning of the Concert System, the effects of nationalism, industrialism, popular democracy and imperialism on the character of diplomacy and the relations of the Great Powers. *Prerequisite:* Hist 172, 173.

HIST 482—INTERNATIONAL RELATIONS SINCE 1914—3 cr. (3 and 0)
The great powers and world politics since 1914. *Prerequisite:* Hist 173 or permission.

HIST 483—EUROPE IN THE TWENTIETH CENTURY—3 cr. (3 and 0)
A study of the political, economic, and social institutions of the European peoples from 1914 to the present. Attention will be given to the world wars and to the collapse of the European state-system.

HIST 484—EUROPEAN INTELLECTUAL HISTORY SINCE 1789—3 cr. (3 and 0)
A survey, based upon representative works, of the major intellectual currents in Europe from the Enlightenment to the present. *Prerequisite:* Hist 173 or permission.

HIST 499—STUDIES IN HISTORY—3 cr. (3 and 0)
An attempt to integrate the student's knowledge and understanding of the field of history by lectures, discussions, and readings on the broad themes of history and their relevance to particular periods and geographical areas. Required of all history majors. *Prerequisite:* Hist 101, 102, 172, 173, and permission of the history adviser.

HIST 610—HISTORY OF COLONIAL AMERICA—3 cr. (3 and 0)

HIST 611—UNITED STATES, 1783-1850—3 cr. (3 and 0)

HIST 612—UNITED STATES, 1850-1900—3 cr. (3 and 0)

HIST 613—UNITED STATES HISTORY, 1890-1933—3 cr. (3 and 0)

HIST 614—THE UNITED STATES SINCE 1933—3 cr. (3 and 0)

HIST 673—MEDIEVAL HISTORY—3 cr. (3 and 0)
(Formerly Hist 702)

HIST 675—THE RENAISSANCE—3 cr. (3 and 0)
(Formerly Hist 704)

HIST 676—EARLY MODERN EUROPE—3 cr. (3 and 0)

HIST 679—EUROPE, 1789-1850—3 cr. (3 and 0)
(Formerly Hist 356)

HIST 680—EUROPE, 1850-1914—3 cr. (3 and 0)
(Formerly Hist 357)

HIST 682—INTERNATIONAL RELATIONS SINCE 1914—3 cr. (3 and 0)

HIST 715—HISTORY OF THE BLACK AMERICAN—3 cr. (3 and 0)

HIST 719—UNITED STATES HISTORY SINCE 1900—3 cr. (3 and 0)

HIST 732—MODERNIZATION OF EAST ASIA—3 cr. (3 and 0)

HIST 741—COMPARATIVE HISTORY OF THE AMERICAS—3 cr. (3 and 0)

HIST 807—UNITED STATES DIPLOMATIC HISTORY SINCE 1877—3 cr. (3 and 0)

HIST 811—INTRODUCTION TO HISTORICAL RESEARCH—3 cr. (3 and 0)

HIST 812—UNITED STATES HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 813—MEDIEVAL HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 814—MODERN EUROPEAN HISTORIOGRAPHY—3 cr. (3 and 0)

HIST 824—SEMINAR IN THE AMERICAN SOUTH—3 cr. (3 and 0)

HIST 825—SEMINAR IN THE CIVIL WAR AND RECONSTRUCTION—3 cr. (3 and 0)

HIST 861—SEMINAR IN MEDIEVAL ENGLAND—3 cr. (3 and 0)

HIST 862—SEMINAR IN MEDIEVAL ENGLAND TO 1485—3 cr. (3 and 0)

HIST 863—SEMINAR IN TUDOR ENGLAND—3 cr. (3 and 0)

HIST 864—SEMINAR IN STUART ENGLAND—3 cr. (3 and 0)

HIST 865—SEMINAR IN MODERN ENGLAND SINCE 1715—3 cr. (3 and 0)

HIST 866—SEMINAR IN MODERN ENGLAND SINCE 1715—3 cr. (3 and 0)

HIST 891—RESEARCH—Credit to be arranged.

HORTICULTURE

Professors: L. O. Van Blaricom, W. L. Ogle, T. L. Senn, *Head*

Associate Professors: J. R. Haun, H. J. Sefick, E. T. Sims, Jr., B. J. Skelton, G. E. Stembridge, F. W. Thode

Assistant Professors: J. P. Fulmer, C. R. Johnson, W. S. Jordan, F. B. Ledeboer

Hort 201—General Horticulture—3 cr. (2 and 2) F, S

A working knowledge of the fundamental plant processes is developed, showing the influence of light, temperature, water and nutrients upon vegetative growth and reproduction of horticultural plants. Production practices, harvesting, storage and marketing of the principal fruit, vegetable and ornamental crops are discussed with demonstrations and practice in greenhouse and orchard. *Prerequisite:* Bot 102, Ch 101.

Hort 302—Principles of Vegetable Production—3 cr. (2 and 3) F

The general principles of vegetable growing and handling. Phases receiving special emphasis are economic importance, producing areas, management practices, plant forcing, cultural practices, irrigation, quality factors, harvesting, grading, packing, storage, market inspection, transportation, refrigeration, exhibition and seed production. *Prerequisite:* Hort 201.

Hort 303—Plant Materials I—3 cr. (2 and 3) F

Woody, ornamental plants and their aesthetic and functional uses in landscape developments. The study covers habit of growth, ultimate size, texture effect, period of bloom, color, and cultural requirements.

Hort 304—Plant Materials II—3 cr. (2 and 3) S

Herbaceous, ornamental plants which are commonly used as garden flowers. This study covers habit of growth, size, period of bloom, color and cultural requirements.

Hort 305—Plant Propagation—3 cr. (2 and 3) F

Methods of propagation; time, manner and material for making cuttings; temperature and media for rooting cuttings or ornamental trees, shrubs and flowering plants; propagating structures, soils and fertilizers. Practical instruction given in field and greenhouse. *Prerequisite:* Hort 201.

Hort 308—Landscape Design—3 cr. (2 and 3) S

Landscape planning of residential and public properties in order to achieve best use and most enjoyment from a given piece of ground. *Prerequisite:* Hort 303.

Hort 310—Floriculture—3 cr. (2 and 3) S

Greenhouse production of commercial flower crops; soils; fertilizers; greenhouse diseases and insects; flower crops to be grown on benches and as pot plants; marketing and costs of production. *Prerequisite:* Hort 201.

Hort 352—Commercial Pomology—3 cr. (2 and 3) F

Fruit bud formation, rest period and water relations of fruit plants, soils, fruit setting; orchard soil management and responses of various fruits to fertilizers; principles of pruning, effect of climatic differences, freezing of tissues and means of avoiding injury; harvesting, transportation and storage. *Prerequisite:* Hort 201.

HORT 405—NUT TREE CULTURE—2 cr. (2 and 0) F, '72 and alternate years.
The production, harvesting and marketing of the principal nut crops with emphasis on the pecan. *Prerequisite:* Hort 201.

HORT 406—NURSERY TECHNOLOGY—3 cr. (2 and 3) S
Principles and techniques in handling nursery crops. *Prerequisite:* Hort 303, 305.

HORT 407—LANDSCAPE DESIGN—3 cr. (2 and 3) F
The first half of this course is a study of trees, shrubs, vines and ground covers used in landscape planting. Attention is given to cultural requirements, growth habits, period of bloom, texture, and fall color. The second half of the course is devoted to landscape planning for small residential properties.

HORT 408—FLORAL DESIGN AND RETAIL MARKETING—2 cr. (1 and 3) F
Studies of the retail flower business with relation to financing, floor plan, equipment, personnel, supplies, salesmanship, advertising, and other important areas. Floral designing for the retail trade will include table arrangements, funeral and wedding designs, as well as corsage and wreath construction.

HORT 409—SEMINAR—1 cr. (1 and 0) F
Recent research work on various phases of horticulture, methods of conducting investigations, and preparation of report of investigations.

HORT 410—SEMINAR—1 cr. (1 and 0) S
A continuation of Hort 409.

HORT 412—TURF MANAGEMENT—3 cr. (2 and 3) F
Studies of warm and cool season turf grasses in relation to regional adaptation, soils, fertilization, general maintenance practices, diseases and insects. Identification of grass and weed species and specific management program for home lawns, golf courses, parks and roadsides. *Prerequisite:* Junior standing.

HORT 451—SMALL FRUIT CULTURE—3 cr. (2 and 3) S
Varieties, soils, sites, culture, fertilizers, harvesting and preparation for marketing of grapes, strawberries, dewberries, blackberries, raspberries, and other small fruits. *Prerequisite:* Hort 201.

HORT 456—VEGETABLE CROPS—3 cr. (3 and 0) S, '73 and alternate years.
The principles and practices employed in the commercial growing and marketing of vegetable crops. Emphasis is placed on temperature requirements, plant characteristics, varieties, soils, fertilizers, weed control, harvesting and preparation for market.

HORT 460—PROBLEMS IN LANDSCAPE DESIGN—5 cr. (3 and 6) F
Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans, costs; further study of materials used; original problems; field study. *Prerequisite:* Hort 308 or 407.

HORT 464—POST HARVEST HORTICULTURE—3 cr. (2 and 2) F
The handling of fruits, vegetables, and ornamental crops after harvesting. Subjects include spoilage problems, hydrocooling, common and cold storage of crops, packaging and processing procedures.

HORT 468—INTRODUCTION TO RESEARCH—2 cr. (1 and 3) S
Principles, developments and changes in research methods related to certain fields of agricultural research. The students obtain practice in experimental

techniques, scientific writing and the use and maintenance of various research instruments and equipment. *Prerequisite:* Senior standing.

HORT 605—NUT TREE CULTURE—2 cr. (2 and 0)

HORT 606—NURSERY TECHNOLOGY—3 cr. (2 and 3)

HORT 607—LANDSCAPE DESIGN—3 cr. (2 and 3)

HORT 608—FLORAL DESIGN AND RETAIL MARKETING—2 cr. (1 and 3)

HORT 610—FLORICULTURE—3 cr. (2 and 3)

HORT 612—TURF MANAGEMENT—3 cr. (2 and 3)

HORT 651—SMALL FRUIT CULTURE—3 cr. (2 and 3)

HORT 652—COMMERCIAL POMOLOGY—3 cr. (2 and 3)

HORT 656—VEGETABLE CROPS—3 cr. (3 and 0)

HORT 660—PROBLEMS IN LANDSCAPE DESIGN—5 cr. (3 and 6)

HORT 664—POST HARVEST HORTICULTURE—3 cr. (2 and 3)

HORT 668—INTRODUCTION TO RESEARCH—2 cr. (1 and 3)

HORT 801—PROBLEMS IN SMALL FRUIT PRODUCTION—3 cr. (3 and 0)

HORT 802—RESEARCH SYSTEMS IN HORTICULTURE—3 cr. (2 and 3)

HORT 803—EXPERIMENTAL OLERICULTURE—3 cr. (3 and 0)

HORT 804—SCIENTIFIC ADVANCES IN ORNAMENTAL HORTICULTURE—3 cr. (3 and 0)

HORT 805—PHYSICOCHEMICAL PROCEDURES FOR DETERMINING QUALITY IN HORTICULTURAL CROPS—3 cr. (2 and 3)

HORT 806—POST-HARVEST PHYSIOLOGY AND HANDLING OF HORTICULTURE CROPS—3 cr. (3 and 0)

HORT 807—POMOLOGY—3 cr. (3 and 0)

HORT 808—SPECIAL INVESTIGATIONS IN HORTICULTURE—2 cr. (2 and 0)

HORT 809—SEMINAR I—1 cr. (1 and 0)

HORT 810—SEMINAR II—1 cr. (1 and 0)

HORT 811—QUANTITATIVE EXPOSITION OF PLANT DEVELOPMENT—2 cr. (1 and 3)

HORT 891—RESEARCH—Credit to be arranged.

HORT 991—DOCTORAL RESEARCH—Credit to be arranged.

HOSPITAL AND HEALTH SERVICES ADMINISTRATION

Professor: F. A. BURTNER
Associate Professor: C. O. SHULER
Visiting Professor: R. E. TOOMEY

H ADM 308—HOSPITAL AND HEALTH SERVICES ADMINISTRATION—3 cr. (3 and 0)

An introduction to the organization and operation of modern American hospitals, separate clinics and public health services. Included will be legal status, organizational pecularities, and specific legislation affecting such agencies. *Prerequisite:* Junior standing.

H Adm 410—Hospital Internship—3 cr. (0 and 9)
The student will spend nine hours per week on a specified program of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. The course will be specifically outlined along with the amount of time the student will spend in each phase or department of the hospital. Student progress will be constantly monitored by University faculty and hospital staff. *Prerequisite:* H Adm 308.

H Adm 610—Hospital Internship—3 cr. (0 and 9)

H Adm 800—The Function and Organization of Hospitals and Health Services Administration—3 cr. (3 and 0)

HUMANITIES

Hum 201—Introduction to the Humanities—3 cr. (3 and 0)
A general introduction to humanistic studies, stressing the interrelatedness of various humanistic disciplines. Such fields as art, architecture, music, literature, philosophy, and drama will be considered as they interact with, support, and develop each other in various cultural settings.

Hum 202—Introduction to the Humanities—3 cr. (3 and 0)
A continuation of Hum 201. *Prerequisite:* Sophomore standing or permission of instructor.

Hum 203—Critical Judgment of the Cinema—3 cr. (3 and 0)
The historical development of the aims and techniques of the cinema; the theory of cinematography, its artistic values, and its critical standards. *Prerequisite:* Sophomore standing.

INDUSTRIAL EDUCATION

Professor: A. F. Newton, *Head*

Associate Professors: J. P. Crouch, D. E. Maurer, H. E. Morgan, Jr.

Assistant Professors: F. A. Bosdell, P. C. Caley, H. P. Pate, W. E. West

In Ed 101—Introduction to Industrial Education—1 cr. (1 and 0)
An introduction to the field of Industrial Education in terms of the underlying philosophies, the aims and goals, and the specific objectives of each of the Industrial Education options.

In Ed 102—Woodworking I—2 cr. (1 and 3)
A study of wood, its properties and the requisite skills necessary for understanding the use of wood in our technological way of life. *Prerequisite:* In Ed 101.

In Ed 202—Woodworking II—2 cr. (1 and 3)
A continuation of In Ed 102 in the study of wood, its properties, skills in machine and tool use with wood, project design, project costs and finishing processes necessary for teachers of industrial subjects. *Prerequisite:* In Ed 102.

IN ED 203—BASIC METAL PROCESSES—3 cr. (1 and 6)

Material separating, forming and combining practices in the metals industries, through the study of basic casting, welding and sheet metal techniques. *Prerequisite:* In Ed 101.

IN ED 204—GRAPHIC ARTS—3 cr. (1 and 6)

Major emphasis is placed on the basic principles underlying the graphic arts. Major areas of study include general photography, graphic layout and design, process photography, offset lithography, screen processing printing, and bindery. Modern industrial applications are stressed throughout. *Prerequisite:* In Ed 101.

IN ED 205—POWER TECHNOLOGY—3 cr. (2 and 2)

A study of power in terms of energy sources, and the generation, transmission and utilization of power. Emphasis is placed on the development of insights and understandings of the scientific and operational principles involved in the production, transmission, and utilization of power. *Prerequisite:* In Ed 101.

IN ED 220—RECREATIONAL AND AVOCATIONAL CRAFTS—3 cr. (2 and 3)

Provides exploratory experiences in the performance of a variety of arts and crafts activities, and encourages the development of an understanding of the purpose of arts and crafts in the comprehensive recreational program.

IN ED 302—DWELLING MATERIALS AND CONSTRUCTION METHODS—2 cr. (1 and 2)

This course is designed as an introduction to the commonly used building materials and the methods of combining them in present day construction. *Prerequisite:* In Ed 102.

IN ED 303—ELECTRICITY—3 cr. (1 and 6)

A laboratory inquiry into the theory and application of components, circuits, and instrumentation associated within the realm of electricity. *Prerequisite:* In Ed 101.

IN ED 304—PHOTOGRAPHIC TECHNIQUES—3 cr. (1 and 6)

Emphasis is placed on applications of black and white and color photography as activities for vocation and avocation. Sufficient laboratory experiences are provided to assure confidence in the use of photographic techniques. The tools and materials of image preparation are also used in conjunction with several graphic reproduction processes to enrich the effectiveness of visual presentations. Problems encountered in action, portrait, still life, and character study photography are considered.

IN ED 305—MACHINING PRACTICES—3 cr. (1 and 6)

Basic practical shop experiences on the lathe, drill press, milling machine and shaper. Benchwork, measuring tools, theory and demonstrations related to a survey of fundamental machining practices. *Prerequisite:* In Ed 101.

IN ED 310—METHODS OF TRADE TEACHING—3 cr. (3 and 0)

This course is designed to give basic instruction to beginning teachers in trade work. Psychological factors of learning; individual differences; methods of teaching subjects; the special methods used in teaching skills; grading of students and keeping of proper records and reports. (Offered in Summer Sessions only.)

IN ED 312—METAL PROCESSES IN THE GENERAL SHOP—3 cr. (3 and 0)

Major emphasis is placed on planning and development of projects in wrought iron, sheet metal, art metal, metal spinning, welding, heat treating and other aspects of metal work that fit into a general shop program. (Offered in Summer Sessions only.)

IN ED 313—ARTS AND CRAFTS—3 cr. (2 and 3)

Emphasis on knowledge and skills in the industrial crafts by lecture, discussion and laboratory experiences. Stress is placed on several crafts basic to industrial production and popularity. Laboratory experience is required in at least four craft areas with an additional experience in one minor craft.

IN ED 315—CONSTRUCTION PRACTICES—3 cr. (3 and 0)

This course is a study of industrial practices commonly employed in the construction industry. Included will be the use of brick, tile, concrete, metal, wood, and other construction materials. (Offered in Summer Sessions only.)

IN ED 316—PLASTICS AND PLASTIC PROCESSES IN THE GENERAL SHOP—3 cr. (3 and 0)

The industrial, commercial and personal uses of plastics are discussed and demonstrated. In addition, the kinds of plastics, their properties, and special uses are studied. (Offered in Summer Sessions only.)

IN ED 318—INDUSTRIAL TECHNOLOGY TECHNIQUES—3 cr. (3 and 0)

Major emphasis is placed on casting, stamping and forming processes, forging and extrusion processes, machining processes, metal spraying or metallurgy, blast cutting, heating and case hardening, assembly processes, bending, finishing processes, inspection gaging. (Offered in Summer Sessions only.)

IN ED 320—MACHINE WOODWORKING—2 cr. (1 and 3)

Basic characteristics of woodcutting, shaping, and finishing operations by use of machinery and auxiliary tools. Includes project work. *Prerequisite:* Junior standing. (Not for Industrial Education students.)

IN ED 325—INDUSTRIAL ORGANIZATIONS AND PEOPLE—3 cr. (3 and 0)

A study of the relationships of personnel to the kinds of tasks they are asked to perform in industrial situations and the ways such situations affect workers. Emphasis is placed an assessment of personnel, organization of industry, working conditions and safety.

IN ED 333—DESIGN—3 cr. (2 and 2)

The study of the principles of form and design elements in two or three dimensions as related to products in the several industrial arts areas. Lectures and laboratory projects stress creativity in the use of materials in reaching design solutions and in developing a personal design philosophy. Limited market and engineering research is conducted along with the study of significant figures in the field. *Prerequisite:* Basic courses in laboratory methods.

IN ED 350—INDUSTRIAL COOPERATIVE EXPERIENCE—6 cr.

A full-time work experience program in industry for industrial vocational-technical education degree candidates. The student, under the cooperative supervision of the University instructor and an industrial supervisor, is placed in industry to receive planned experiences in the technical specialty which he is preparing to teach. The University instructor will coordinate placement, supervision, and evaluation of the student. The course is offered during the summer only and students are required to register with the instructor one semester prior to the summer in which he plans to enroll. *Prerequisite:* Junior standing in the industrial vocational-technical education program and approval of instructor.

In Ed 372—Arts and Crafts for the Elementary Child—3 cr. (2 and 3)
Provides the elementary teacher with an opportunity to develop skills and knowledge in the use of a variety of media suitable for integrating the study of industry and industrial technology into the usual classroom procedures.

In Ed 402—Directed Teaching—6 cr. (0 and 18)
Supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for securing experience in teaching industrial subjects. *Prerequisite:* In Ed 416, 425, and grade-point ratio required for graduation.

In Ed 405—Course Organization and Evaluation—3 cr. (3 and 0)
Problems, techniques and procedures in the preparation, selection and organization of subject matter for instructional purposes. Methods, techniques and preparation of materials used in the evaluation of student achievement in industrial education subjects.

In Ed 408—Training Programs in Industry—3 cr. (3 and 0)
Basic concepts of supervision, administration, and management of training programs. Emphasis on determining training requirements, planning, directing, and evaluating training programs.

In Ed 410—Special Institute Course: Topics in Industrial Education—3 cr. (3 and 0)
Subject areas organized according to Institute needs. Content of the course will be planned cooperatively by the University and the school system or agency requesting the course. *Prerequisite:* Teacher or Graduate standing.

In Ed 414—Electronics for Teachers—3 cr. (1 and 6)
Principles of electronics as applied in communications and automatic controls involving vacuum tubes, transistors, integrated circuits, and other electronic devices and materials for the preparation of teachers of industrial arts and vocational-technical electricity and electronics. *Prerequisite:* In Ed 303.

In Ed 416—Design and Operation of Industrial Education Laboratories—3 cr. (2 and 2)
This course deals with laboratory design requirements of unit laboratories as well as multi-activity laboratories. Selection and procurement of tools and equipment, budgeting management and the coordination of activities in the laboratory are considered. *Prerequisite:* In Ed 313.

In Ed 421—Vocational Cooperative Programs—2 cr. (2 and 0)
A study of the developments, objectives and principles of industrial cooperative training programs. Emphasis is on the organization, promotion, and management of programs in this area of vocational education.

In Ed 422—History and Philosophy of Industrial and Vocational Education—3 cr. (3 and 0)
A study of industrial and vocational education programs with the intent of developing a sound individual philosophy of industrial and vocational edu-

cation. General topics covered: history; local, state, and federal legislation; types of vocational-technical programs; professional organizations; manpower utilization, vocational guidance, and training; industry, labor, and school relationships.

In Ed 425—Teaching Industrial Subjects—3 cr. (3 and 0)
Effective methods and techniques of teaching industrial subjects. Emphasis is given to class organization, preparation of lesson outlines, and audio-visual aids. *Prerequisite:* Ed 335.

In Ed 432—Advanced Woodworking—2 cr. (1 and 3)
An advanced consideration of machine methods and developments, materials, quality factors, and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 102, 202.

In Ed 435—Advanced Welding—2 cr. (1 and 3)
An advanced consideration of studies originated in In Ed 203, new theories and developments in welding technology. Inspection trips, written and oral reports. *Prerequisite:* In Ed 203.

In Ed 436—Advanced Material Forming—2 cr. (1 and 3)
Advanced consideration of studies initiated in In Ed 203, development and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 203.

In Ed 438—Advanced Machining—2 cr. (0 and 6)
Advanced experiences in the set-up, operation and maintenance of machine tools and equipment. Project and product design. Study and reports of recent machining technological developments. *Prerequisite:* In Ed 305.

In Ed 440—Advanced Techniques of the Graphic Arts—3 cr. (1 and 6)
Students selecting to pursue the area of graphic arts will gain experience in the development of advanced techniques of layout and design; photographic copy preparation; cold type composition; line, halftone, duotone, and special effects photography, and advanced platemaking and pressmanship.

In Ed 441—Comprehensive General Shop Practices—2 cr. (2 and 0)
This course deals with the problems in the administration of the multiple activity programs in the comprehensive laboratory. Consideration and planning of multiactivity laboratory programs of instruction for the secondary schools is the major focus. *Prerequisite:* In Ed 313.

In Ed 442—Competency Testing in Vocational Subjects—3 cr. (3 and 0)
This course is especially designed for trade teachers who have assisted in making trade tests for S. C. Certification program. Teachers who expect to assist in making trade tests are also urged to enroll in this course. The course is devoted to revising present trade tests and developing tests in new fields. (Offered in Summer Sessions only.)

In Ed 444—Graphic Arts Production Control—3 cr. (2 and 3)
A study of commercial and industrial printing control. Emphasis is placed upon considerations for decision making in the areas of process and equipment selection, capital investment, and plant layout. Other topics include production flow, cost analysis, personnel supervision and training, and recent develop-

ments as they affect production. *Prerequisite:* In Ed 204, 440, and permission of instructor.

IN ED 450—INDUSTRIAL COOPERATIVE EXPERIENCE—6 cr.
Continuation of In Ed 350. Summer only. *Prerequisite:* Senior standing, In Ed 350, and approval of instructor.

IN ED 451—SPECIAL PROJECTS—3 cr. (3 and 0)
The student is assigned a project in accordance with his needs and capabilities. Projects are either experimental, theoretical or developmental and cover subjects not thoroughly covered in other courses.

IN ED 496—PUBLIC RELATIONS—3 cr. (3 and 0)
This course emphasizes the techniques and methods of effective public and industrial relations which contribute to understanding and cooperation of labor, business, professional, educational, and industrial groups.

IN ED 605—COURSE ORGANIZATION AND EVALUATION—3 cr. (3 and 0)

IN ED 608—TRAINING PROGRAMS IN INDUSTRY—3 cr. (3 and 0)

IN ED 610—SPECIAL INSTITUTE COURSE: TOPICS IN INDUSTRIAL EDUCATION—3 cr. (3 and 0)

IN ED 614—ELECTRONICS FOR TEACHERS—3 cr. (1 and 6)

IN ED 616—DESIGN AND OPERATION OF INDUSTRIAL EDUCATION LABORATORIES—3 cr. (2 and 2)

IN ED 622—HISTORY AND PHILOSOPHY OF INDUSTRIAL AND VOCATIONAL EDUCATION—3 cr. (3 and 0)

IN ED 625—TEACHING INDUSTRIAL SUBJECTS—3 cr. (3 and 0)

IN ED 632—ADVANCED WOODWORKING—2 cr. (1 and 3)

IN ED 635—ADVANCED WELDING—2 cr. (1 and 3)

IN ED 636—ADVANCED MATERIAL FORMING—2 cr. (1 and 3)

IN ED 638—ADVANCED MACHINING—2 cr. (1 and 3)

IN ED 640—ADVANCED TECHNIQUES OF THE GRAPHIC ARTS—3 cr. (1 and 6)

IN ED 641—COMPREHENSIVE GENERAL SHOP PRACTICES—2 cr. (2 and 0)

IN ED 644—GRAPHIC ARTS PRODUCTION CONTROL—3 cr. (2 and 3)

IN ED 696—PUBLIC RELATIONS—3 cr. (3 and 0)

IN ED 815—SEMINAR IN INDUSTRIAL EDUCATION—1 cr. (1 and 0)

IN ED 820—RECENT PROCESS DEVELOPMENTS—3 cr. (3 and 0)

IN ED 840—SCHOOL SHOP DESIGN—3 cr. (3 and 0)

IN ED 845—CURRICULUM PLANNING AND DEVELOPMENT IN INDUSTRIAL EDUCATION—3 cr. (3 and 0)

IN ED 860—CURRICULUM MATERIALS DEVELOPMENT IN INDUSTRIAL EDUCATION—3 cr. (3 and 0)

IN ED 861—ADMINISTRATION AND SUPERVISION OF VOCATIONAL EDUCATION—3 cr. (3 and 0)

IN ED 865—AMERICAN INDUSTRIES—3 cr. (3 and 0)

In Ed 891—Research in Industrial Education— Credit to be arranged.

In Ed 895—Special Problems I—3 cr. (3 and 0)

In Ed 896—Special Problems II—3 cr. (3 and 0)

INDUSTRIAL ENGINEERING

Professor: E. Laitala, *Head*
Associate Professor: J. H. Couch

IE 301—Process Planning I—3 cr. (2 and 3)
Study of methods of conversion of raw materials into finished products. Emphasis is from the viewpoint of management and control of manufacturing operations. Includes basic terminology, interpretation and use of engineering plans, impact of production volume. This course will examine various manufacturing processes including material removal, casting, joining and forming of materials, and associated measurement techniques. *Prerequisite:* EG 103 or 109, Phys 122.

IE 303—Job Evaluation and Wage Incentives—3 cr. (3 and 0)
Job description, specification, and classification. Systems employed for establishing relative ranks of jobs. Basic wage and salary determination. Wage incentive methods. *Prerequisite:* IE 307, 410, or consent of instructor.

IE 304—Methods and Standards—3 cr. (2 and 3)
Fundamentals relating to work methods design and analysis. Includes study of techniques necessary for determining efficient work methods. Work measurement as a basis for control of costs and scheduling. *Prerequisite:* Junior standing.

IE 306—Process Planning II—3 cr. (2 and 3)
Study of recent process developments and impact on planning and control of manufacturing operations. Numerical control of machines, computer-aided design, zero defects program, and others. Special laboratory investigations, and value engineering project. *Prerequisite:* IE 301.

IE 307—Survey of Engineering—3 cr. (3 and 0)
An examination of engineering in terms of fundamentals employed, criteria governing engineering decisions, basic functions, and plans created. The kinds of interactions and interdependencies between engineering and non-engineering functions are identified as a basis for optimum organization design. Open to students planning employment in industry including both engineering and non-engineerings majors. *Prerequisite:* Phys 208, or 221, and Junior standing.

IE 403—Process Planning III—3 cr. (3 and 0)
Continuation of IE 306; study of latest process developments. *Prerequisite:* IE 306.

IE 405—Plant Layout and Material Handling—3 cr. (2 and 3)
Fundamentals underlying the planning of factory layout for new products and increases in production volume. Layout by product and process. Scale model, template, and other planning techniques. Materials handling analysis and equipment decisions. *Prerequisite:* IE 301, IM 408, or consent of instructor.

IE 407—Industrial Application of Statistics—3 cr. (2 and 3)
Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability analysis, and machine interference. *Prerequisite:* Math 208, 301.

IE 408—Plant Design—2 cr. (1 and 3)
Integration of unit operations into a total production system. Study of analytical procedures for determining layout of production and other facilities, line balance, manner in which operations shall be linked or material moved between them. Creation and analysis of alternative designs. *Prerequisite:* IE 304 and Senior standing.

IE 410—Engineering and Organization—3 cr. (3 and 0)
The nature of industrial enterprise in terms of purpose, organization structure, governing criteria, responsibilities and relationships of various functional groups. Project engineering and organization. Analysis and coordination of engineering functions as foundation for engineering management.

IE 412—Seminar—1 cr. (1 and 0)
Library research and oral reports covering recent technological developments in the field of industrial engineering. Consideration of professional responsibilities and post graduation plans. A major term paper is required. *Prerequisite:* Senior standing in Industrial Engineering.

IE 413—Seminar—1 cr. (1 and 0)
Continuation of IE 412. *Prerequisite:* IE 412.

INDUSTRIAL MANAGEMENT

Professors: C. C. Davis, B. J. Todd, C. H. Whitehurst, Jr., *Head*

Associate Professors: Susan H. Brown, F. R. Gray, E. A. LaRoche, J. L. Richardson, G. D. Riggs,* C. O. Shuler, C. R. Smith, J. M. Wannamaker

Assistant Professors: R. W. Barron, S. C. Dudley, C. L. Dyer, Edward L. Powers, J. A. Turner, T. Hinds Wilson, R. F. Zant

Instructors: B. B. Johnson, Cheryl J. Skinner

Visiting Professors: R. L. Brown, R. E. Toomey

Part-time Visiting Lecturer: S. T. Peden

IM 100—Introduction to Industrial Management—0 cr. (1 and 0)
A series of lectures by University and industry speakers in which the role of the industrial manager in society is examined and explained. Particular emphasis is placed on orienting the student to understanding the manager's function in a market system economy.

IM 201—Introduction to Industrial Management—3 cr. (3 and 0)
An introductory survey of management's role as a fourth factor of economic production.

IM 299—Computer Programming I—1 cr. (0 and 3)
An elementary operating course primarily designed to familiarize the student with the various capabilities of electronic computers. A demonstrated

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* On leave.

ability to write basic programs applicable to management areas is required. *Prerequisite:* Permission of instructor.

IM 304—QUALITY CONTROL—3 cr. (3 and 0)

Basic control techniques in the field of industrial production, inspection and experimentation. Various sampling, control and inspection problems are studied with special reference to practical applications. Underlying theory, assumptions and limitations are presented. *Prerequisite:* Math 203 or 301.

IM 306—CORPORATION FINANCE—3 cr. (3 and 0)

The organization and operation of corporations with emphasis on the nature and influences of the various sources of funds. *Prerequisite:* Junior standing.

IM 307—PERSONNEL MANAGEMENT—3 cr. (3 and 0)

An introductory course dealing with the principles and policies governing present day employee-employer relationships. Attention directed to methods of electing, training, placing, and promoting of employees to develop sound personnel techniques. *Prerequisite:* Junior standing.

IM 308—MARKETING STRATEGY—3 cr. (3 and 0)

This course is designed to explore the development of current marketing concepts and their use in a strategic business situation. Emphasis is placed upon the qualitative aspects of promotional strategy, product design and development, concept testing, methods of distribution, and pricing. The student is introduced to the controllable and uncontrollable variables in marketing and begins to develop an understanding of how each may be used to best advantage in a competitive situation.

IM 312—COMMERCIAL LAW—3 cr. (3 and 0)

An introduction to business law with primary attention given to contracts, agency, negotiable instruments and sales. *Prerequisite:* Junior standing.

IM 313—COMMERCIAL LAW—3 cr. (3 and 0)

Continuation of IM 312 with emphasis on business organization, personal and real property, estates and bankruptcy and security services.

IM 322—LEGAL ENVIRONMENT OF BUSINESS—3 cr. (3 and 0)

A comprehensive study of the development of governmental regulation of business including both state and national regulations. Attention is given to the constitutional source and limitation of power in both governments; specific areas in which the governments have acted (production, labor, combinations, prices, etc.) and the regulations that have been imposed in these areas; and the scope of the administrative process.

IM 401—MARKETING ANALYSIS I—3 cr. (3 and 0)

An examination of the activities involved in the flow of goods and services from producer to consumer. Stressed will be the application of quantitative techniques for predicting sales and evaluating alternative promotional strategies. *Prerequisite:* Senior standing in Industrial Management or permission of instructor.

IM 402—OPERATIONS PLANNING AND CONTROL—3 cr. (3 and 0)

The application of modern statistical and mathematical techniques to the planning and control of industrial operations. Emphasis will be placed on applications in forecasting, inventory, production scheduling and control, equipment selection and replacement, maintenance and materials handling. *Prerequisite:* IM 304 and Senior standing.

IM 403—Special Problems—2 cr. (2 and 0)
Each student will plan and develop a research project related to the field of management or defense studies. *Prerequisite:* Senior standing in Industrial Management.

IM 404—Managerial Economics—3 cr. (3 and 0)
The objective of this course is to bridge the gap between theory and managerial practices. Its stress is on the use of tools of economic analysis in classifying problems, in organizing and evaluating information, and in comparing alternative courses of action. *Prerequisite:* Mgt Sc 311, or permission of instructor.

IM 405—Economics of Transportation—3 cr. (3 and 0)
History and structure of transportation systems of the United States; the nature of transportation costs and rates. Transportation systems as factors in industrial location. Government policy towards transportation. *Prerequisite:* Senior standing and permission of instructor.

IM 406—Theory of Industrial Location—3 cr. (3 and 0)
A theoretical study of the general factors which determine plant location in a capitalist society. Particular attention is paid to surveying current literature. A comparison of location theory and actual location patterns is stressed. *Prerequisite:* Senior standing and permission of instructor.

IM 407—Directed Research—1 cr. (1 and 0)
Each student will plan and develop a research project related to the field of management. *Prerequisite:* Senior standing in Industrial Management.

IM 408—Work Simplification and Standardization—3 cr. (3 and 0)
Principles and practices of motion and time as it is applied to industry. Emphasis is given to its application and its influence on methods, material handling, plant layout, and time study procedures.

IM 409—Management Simulation—0-1 cr. (0 and 3)
Practice in managerial decision-making under simulated competitive industry conditions. Guidance is furnishesd by the staff member administering the requirement. The model is designed to derive maximum benefit from previous courses in economics, econometrics and statistics. *Prerequisite:* Senior standing and permission of instructor.

IM 410—Marketing Research I—1 cr. (1 and 0)
A directed research course oriented toward those students interested in a career in marketing.

IM 411—Marketing Research—2 cr. (2 and 0)
A directed research course oriented toward those students interested in a career in marketing.

IM 412—Marketing Analysis II—3 cr. (3 and 0)
A continuation of Marketing Analysis, IM 401. *Prerequisite:* IM 308 or permission of instructor.

IM 413—Marketing Communications—3 cr. (3 and 0)
The vital role of advertising and public relations in today's marketing strategy is examined. Promotional mixes will be designed so as to be a blend of the markets, media, and messages by which corporate communications are maintained with buyers. Communications theory is explored and then the communications process is analyzed with emphasis on its effect upon the flow of goods and services to the consuming public. *Prerequisite:* IM 308.

IM 415—Managerial Decision Making—3 cr. (3 and 0)
Management problems and methods involved in the operation of manufacturing institutions, including location, equipment investment, organization structure, and budgets. Attention is given primarily to the above areas by the use of the case method. Emphasis on oral and written communication. *Prerequisite:* Permission of instructor.

IM 416—Management of Human Resources—3 cr. (3 and 0)
A course designed to orient the student toward recent developments in enlightened uses of human resources with emphasis on procurement, training, development, rewarding and retention of such resources. *Prerequisite:* Permission of instructor.

IM 417—Manufacturing Logistics—3 cr. (3 and 0)
A study of more advanced manufacturing and production techniques including predetermined motion time data systems, micromotion study analysis, work sampling or ratio delay studies, zero defects, materials handling techniques, machine interference, time study formula construction, machinery and equipment replacement calculations, economic lot size determination, development and use of standard data, cost reduction programs, operator training methods, charting of time study data, problems of machinery and equipment layout, and developing of complex time standards. *Prerequisite:* IM 408 or permission of instructor.

IM 418—Management Information Systems—3 cr. (3 and 0)
A study of the design and use of communication processes in which data are recorded, transmitted and revised as an aid in management decision making in operations planning and controlling.

IM 420—Management of Defense Expenditures—3 cr. (3 and 0)
Examines the various components and budget classifications of the Department of Defense. Responsibility for the management of these expenditures and methods employed are treated extensively. *Prerequisite:* Econ 419, Economics of Defense, or permission of instructor.

IM 499—Computer Programming II—1 cr. (0 and 3)
Each student will complete a research project relating to the accomplishment of some management function in which a computer program is now—or is expected to be—of cardinal importance. Students selecting the Defense Studies area concentration may complete the course requirement in that field. *Prerequisite:* IM 299 or equivalent.

IM 601—Marketing Analysis I—3 cr. (3 and 0)

IM 602—Operations Planning and Control—3 cr. (3 and 0)

IM 604—Managerial Economics—3 cr. (3 and 0)

IM 605—Economics of Transportation—3 cr. (3 and 0)

IM 606—Theory of Industrial Location—3 cr. (3 and 0)

IM 608—Work Simplification and Standardization—3 cr. (2 and 3)

IM 612—Marketing Analysis II—3 cr. (3 and 0)

IM 615—Managerial Decision Making—3 cr. (3 and 0)

IM 617—Manufacturing Logistics—3 cr. (3 and 0)

IM 618—Management Information Systems—3 cr. (3 and 0)

IM 620—Management of Defense Expenditures—3 cr. (3 and 0)

MANAGEMENT

Mgt 800—Management Simulation—1 cr. (0 and 3)

Mgt 801—Quantitative Economic Analysis—3 cr. (3 and 0)

Mgt 802—Finance—3 cr. (3 and 0)

Mgt 803—Operations Management—3 cr. (3 and 0)

Mgt 804—Managerial Policy—3 cr. (3 and 0)

Mgt 805—Quality Control—3 cr. (3 and 0)

Mgt 810—Management and the Law—3 cr. (3 and 0)

Mgt 811—Advanced Marketing Analysis—3 cr. (3 and 0)

Mgt 816—Management of Human Resources—3 cr. (3 and 0)

Mgt 891—Thesis—3 cr.

MANAGEMENT SCIENCE

Professors: B. J. Todd, C. H. Whitehurst, Jr.

Associate Professors: E. A. LaRoche, G. D. Riggs *

Assistant Professors: C. L. Dyer, T. H. Wilson, R. F. Zant

Mgt Sc 310—Introduction to Management Science—3 cr. (3 and 0)
An introduction to quantitative methods of the management scientist with applications to economic and industrial problems. The course is designed to introduce the student to the use of mathematics, statistics, and accounting as tools in managerial decision making. *Prerequisite:* Math 203, Econ 202.

Mgt Sc 311—Introduction to Econometrics—3 cr. (3 and 0)
An introduction to economic measurement. Emphasis is placed upon the mathematical formulation of economic theory, the application of calculus to economic theory, and the application of statistics with particular emphasis on the use of regression analysis in economics. Elementary econometric models are introduced. *Prerequisite:* Math 301, Econ 314.

Mgt Sc 413—Management Science I—3 cr. (3 and 0)
The role and uses of management science techniques in decision making in business and industry; the problems of internal operation of a business enter-

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* On leave.

prise in static and dynamic settings under conditions of certainty, risk and uncertainty. Deterministic models will be emphasized, and topics include classical optimization, marginal analysis, programming, the transportation problem, allocation and assignment, the game theory. Attention will also be given to input-output, network analysis, and decision theory. *Prerequisite:* Consent of instructor.

MGT SC 414—STATISTICAL ANALYSIS—3 cr. (3 and 0)
This course is designed to provide the student with sufficient understanding of modern statistical methods to make judicious application of statistics in management decision making. Emphasis is placed on the proper design, analysis and interpretation of planned experiences in internal operations. Topics include single factor through fractional factorial experiments, response surface methodology and evolutionary operations. *Prerequisite:* Math 301 or equivalent.

MGT SC 611—INTRODUCTION TO ECONOMETRICS—3 cr. (3 and 0)

MGT SC 613—MANAGEMENT SCIENCE I—3 cr. (3 and 0)

MGT SC 614—STATISTICAL ANALYSIS—3 cr. (3 and 0)

MGT SC 806—REGIONAL SCIENCE METHODS—3 cr. (3 and 0)

MGT SC 807—ECONOMETRIC METHODS I—3 cr. (3 and 0)

MGT SC 808—ECONOMETRIC METHODS II—3 cr. (3 and 0)

MGT SC 812—MANAGEMENT SCIENCE II—3 cr. (3 and 0)

MATERIALS ENGINEERING

Associate Professors: F. W. COOKE, M. J. EITEL, S. F. HULBERT, *Program Coordinator;* J. S. WOLF

Assistant Professors: J. J. KLAWITTER, D. D. MOYLE

MATE 301—INTRODUCTION TO METALLURGICAL ENGINEERING—3 cr. (3 and 0)
An introduction to the structure and properties of engineering materials. Topics included are bonding in solids, mechanical behavior, equilibrium and non-equilibrium behavior of mixtures and alloys, material-environment interaction, selection of materials for engineering uses, and analysis of material failures. Emphasis is placed on metals and polymers. *Prerequisite:* Junior standing in engineering or the physical sciences, Ch 102, Phys 221.

MATE 302—MATERIALS ENGINEERING LABORATORY—2 cr. (1 and 3)
Laboratory practice in the determination and analysis of the properties of engineering materials. Topics included are specimen selection and preparation, microscopy, photography, temperature measurement, thermal analysis, and mechanical testing. *Prerequisite:* MatE 301 or CrE 310.

MATE 307—INTRODUCTION TO POLYMER ENGINEERING—3 cr. (3 and 0)
An introduction to the materials engineering of organic polymers. Principles and practice of synthesis of macromolecules; polymerization through addition and condensation; copolymerization; block and graft polymerization. Characterization of polymers in solution; molecular weight averages and polymolecularity. Structure and properties of polymers in the condensed state; crystalline-amorphous system; theory of rubber elasticity, mechanical, thermal, optical, and electrical behavior. *Prerequisite:* Freshman chemistry.

MatE 312—Materials Engineering Thermodynamics—3 cr. (3 and 0)
An introduction to the thermodynamics of materials with special emphasis on metallic systems. Topics included are atomic and crystalline properties of metals, solid solutions and intermetallic compounds, the thermodynamic laws and their relation to solution theory and phase equilibria, and applications of the above to the phase equilibria in unary, binary, and ternary metallic systems with special regard to microstructural evolution. *Prerequisite:* MatE 301 or CrE 310.

MatE 405—Physical Metallurgy I—3 cr. (3 and 0)
A comprehensive treatment of electron theory, lattice defects, diffusion, solutions and phase equilibria, phase transformations, creep and fracture applied to metals and simple alloys, with emphasis on structure-property relationships. *Prerequisite:* MatE 301 or CrE 310.

MatE 406—Physical Metallurgy II—3 cr. (3 and 0)
A continuation of MatE 405. *Prerequisite:* MatE 405.

MatE 408—Principles of Polymer Science I—3 cr. (3 and 0)
An introduction to the materials science of organic polymers. The structures for many types of polymers are surveyed and correlated with macroscopically observable characteristics. The general properties of pure and coexisting polymer phases are defined, and thermally dependent phase transitions are discussed. Further considerations are devoted to swelling phenomena, degradation and stabilization mechanisms, surface modification methods, and to properties of composite structures. *Prerequisite:* MatE 307, or 301, CrE 310, or an equivalent course.

MatE 409—Principles of Polymer Science II—3 cr. (3 and 0)
A continuation of the introductory course in polymer science. Polymerization methods are surveyed, and the polymerization kinetics of one type of system is dealt with in detail. Quantitative treatments are presented for various experimental procedures that involve dilute polymer solutions. Further considerations are concerned with important testing techniques, and with the unique behavior of some polyelectrolyte systems. *Prerequisite:* MatE 408 or an equivalent course.

MatE 411—Materials Engineering Kinetics—3 cr. (3 and 0)
An introduction to the important rate processes in solid materials. Topics included are homogeneous and heterogeneous phase transitions, solidification and other nucleation processes, recrystallization and grain growth, and sintering reactions. Emphasis is placed upon the effects of these phenomena on the properties of engineering materials. *Prerequisite:* A course in thermodynamics.

MatE 421—Mechanical Metallurgy—3 cr. (3 and 0)
A comprehensive treatment of the concepts of the atomic and microstructural processes which govern the mechanical behavior of metals, alloys, metal oxides, and composite structures. The theories of plastic deformation, creep, and fatigue are applied to metal working processes and the selection of materials for loadbearing applications. *Prerequisite:* MatE 301 or CrE 310.

MATE 450—SPECIAL TOPICS IN MATERIALS ENGINEERING—1-3 cr. (0-3 and 9-0)

A comprehensive study of a topic of current interest in the field of materials engineering. May be taken for credit more than one time. *Prerequisite:* Consent of instructor.

MATE 451—CORROSION OF MATERIALS—3 cr. (2 and 3)

An introduction to the aqueous and gaseous corrosion of metals and alloys. Topics included are ion migration in solid and liquid phases, Pourbaix diagrams, theory and application of corrosion rate measurements, and special corrosion process as they apply to metal degradation and failure. *Prerequisite:* A course in thermodynamics.

MATE 605—PHYSICAL METALLURGY I—3 cr. (3 and 0)

MATE 606—PHYSICAL METALLURGY II—3 cr. (3 and 0)

MATE 608—PRINCIPLES OF POLYMER SCIENCE I—3 cr. (3 and 0)

MATE 609—PRINCIPLES OF POLYMER SCIENCE II—3 cr. (3 and 0)

MATE 621—MECHANICAL METALLURGY—3 cr. (3 and 0)

MATE 650—SPECIAL TOPICS IN MATERIALS ENGINEERING—1-3 cr. (0-3 and 9-0)

MATE 651—CORROSION OF MATERIALS—3 cr. (2 and 3)

MATE 800—SEMINAR IN MATERIALS RESEARCH—1 cr. (1 and 0)

MATE 802—RESEARCH TECHNIQUES IN PHYSICAL METALLURGY—3 cr. (2 and 3)

MATE 805—PHYSICAL METALLURGY I—3 cr. (3 and 0)

MATE 806—PHYSICAL METALLURGY II—3 cr. (3 and 0)

MATE 807—PHYSICAL PROPERTIES OF POLYMERS—3 cr. (3 and 0)

MATE 808—MECHANICAL PROPERTIES OF POLYMERS—3 cr. (3 and 0)

MATE 810—DIFFUSION IN SOLIDS—3 cr. (3 and 0)

MATE 811—KINETICS OF HETEROGENEOUS REACTIONS—3 cr. (3 and 0)

MATE 812—METALLURGICAL THERMODYNAMICS—3 cr. (3 and 0)

MATE 814—SURFACE CHEMISTRY OF MATERIALS—3 cr. (3 and 0)

MATE 815—APPLICATION OF HETEROGENEOUS EQUILIBRIA—3 cr. (3 and 0)

MATE 820—DEFORMATION MECHANISMS IN SOLIDS—3 cr. (3 and 0)

MATE 821—STRENGTH MECHANISMS IN SOLIDS—3 cr. (3 and 0)

MATE 831—QUANTUM THEORY OF METALS I—3 cr. (3 and 0)

MATE 835—X-RAY METALLOGRAPHY—3 cr. (2 and 3)

MATE 841—SINTERING AND RELATED PHENOMENA—3 cr. (3 and 0)

MATE 850—SPECIAL TOPICS IN MATERIALS ENGINEERING—3 cr. (3 and 0)

MATE 851—OXIDATION OF METALS AND ALLOYS—3 cr. (3 and 0)

MATE 891—RESEARCH—Credit to be arranged.

MATE 991—DOCTORAL RESEARCH—Credit to be arranged.

MATHEMATICS

Professors: C. V. Aucoin, F. M. Cholewinski, R. E. Haymond, A. T. Hind, Jr., J. W. Kenelly, *Head;* A. Sobczyk

Associate Professors: K. Alam, M. C. Bell, A. K. Bose, J. V. Brawley, Jr.,* E. C. Coker, Jr., A. S. Cover, J. L. Flatt, J. D. Fulton, J. C. Harden, Jr., W. R. Hare, Jr., P. T. Holmes, C. E. Kirkwood, Jr., J. W. LaGrone, Renu C. Laskar, D. R. LaTorre, S. M. Lukawecki, M. C. Palmer, E. Park, T. G. Proctor, J. A. Reneke, L. A. Rife, W. H. Ruckle, K. Seo, E. L. Stanley, J. R. Sullivan, K. T. Wallenius

Assistant Professors: Claire R. Aucoin, W. R. Boland, Sue K. Dunkle, R. E. Fennell, J. K. Luedeman, J. H. Nicholson, J. C. Peck, J. C. Pomfret, B. J. Prochaska, C. B. Russell, J. A. Zimmer

Instructors: Eugenie V. Bartmess, Louise G. Fulmer, Jeuel G. LaTorre

Math 011—Mathematics—5 cr. (5 and 2)

Basic algebraic methods. A general review and development of fundamental mathematical concepts. Basic numerical processes and techniques of algebra. Designed to prepare students for college courses.

Math 012—Mathematics—5 cr. (5 and 2)

Basic geometric concepts. A general review and development of elementary geometric and spacial concepts. Mensuration formulas and elementary properties of spacial figures. Designed to prepare students for college courses.

Math 100—College Algebra—2 cr. (5 and 0)

Required of all freshmen who fail to make a satisfactory grade on the Mathematics Test, Level I (Standard). An intensified review of high school algebra and the topics listed under Math 103. Students enrolled in Math 100 must receive a passing grade in this course before they are eligible to enroll in any other mathematics course. Math 100 may be substituted for Math 103.

Math 101—Mathematical Analysis I—3 cr. (3 and 0)

Topics include: probability spaces, conditional probabilities and discrete random variables. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard), or consent of instructor.

Math 102—Mathematical Analysis II—3 cr. (3 and 0)

Topics include: intuitive calculus (differentiation and integration), continuous random variables, and probability densities. *Prerequisite:* Math 101 or consent of instructor. Not open to those receiving credit for Math 106.

Math 103—College Algebra—2 cr. (3 and 0)

Algebraic processes, functions, equations, inequalities, mathematical induction, theory of equations, determinants, and logarithms. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard).

Math 104—Trigonometry—2 cr. (3 and 0)

Trigonometric functions, equations, identities, and solution of triangles. Logarithms and complex numbers. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard).

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* On leave.

MATH 106—CALCULUS OF ONE VARIABLE—4 cr. (5 and 0)
Topics include: analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, techniques of integration, and approximations. *Prerequisite:* Math 103, 104, or a satisfactory score on the Mathematics Test Level I (Standard), or consent of instructor.

MATH H106—CALCULUS OF ONE VARIABLE—4 cr. (5 and 0)
Same as Math 106 except that this honors section is open to students only by invitation.

MATH 108—CALCULUS AND LINEAR ALGEBRA—4 cr. (5 and 0)
Topics include: matrices and vectors, transformation and matrices, representations of linear transformations and the topics in calculus are infinite series, limits, differentiation and integration. *Prerequisite:* Math 106.

MATH H108—CALCULUS AND LINEAR ALGEBRA—4 cr. (5 and 0)
Same as Math 108 except this honors section is open to students only by invitation.

MATH 115—CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS I—3 cr. (3 and 0)
Logic, sets, and the properties of the counting numbers, numeration systems.

MATH 116—CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS II—3 cr. (3 and 0)
A continuation of Math 115. Subtraction, properties of the integers, elementary number theory, rational number system, real number system. *Prerequisite:* Math 115; open only to elementary school majors or consent of instructor.

MATH 203—ELEMENTARY STATISTICAL INFERENCE—3 cr. (3 and 0)
A survey course in fundamental statistical principles with applications to social sciences and other fields. The development of the course will assume knowledge of finite probability. Major topics include: empirical frequency distributions, computation of descriptive statistics, basic statistical inference including estimation and testing of hypotheses, regression and correlation analysis, and contingency tables. *Prerequisite:* Math 102, or a 3-credit course in finite probability, or consent of instructor.

MATH 206—CALCULUS OF SEVERAL VARIABLES—4 cr. (5 and 0)
Topics include: real valued functions of several variables, multiple integration, differential calculus of functions of several variables, applications, vector field theory. *Prerequisite:* Math 108.

MATH H206—CALCULUS OF SEVERAL VARIABLES—4 cr. (5 and 0)
Same as Math 206 except this honors section is open to students only by invitation.

MATH 207—MULTIPLE DIMENSION CALCULUS—3 cr. (3 and 0)
Principal topics include differential and integral calculus for functions of several variables, extreme values of functions, Lagrangian multipliers, differential equations and difference equations. Examples from the managerial and social sciences. *Prerequisite:* Math 108.

MATH 208—ENGINEERING MATHEMATICS I—4 cr. (5 and 0)
This course presents an introduction to the study of differential equations and their application to physical problems. The topics include exact solutions, series solutions, numerical solutions, solutions by means of Laplace transforms, and solutions of systems of differential equations. *Prerequisite:* Math 206.

MATH H208—ENGINEERING MATHEMATICS I—4 cr. (5 and 0)
Same as Math 208 except that this honors section is open to students only by invitation.

MATH 215—ALGEBRA FOR ELEMENTARY SCHOOL TEACHERS—3 cr. (3 and 0)
Linear equations and linear inequalities in one variable, functions and graphs, systems of linear equations and linear inequalities, quadratic equations, complex number system. Finite number systems, algebraic structures. *Prerequisite:* Math 116 or consent of instructor.

MATH 216—GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS—3 cr. (3 and 0)
An informal treatment of the basic concepts of geometry. *Prerequisite:* Math 116; open only to elementary school majors or consent of instructor.

MATH 295—FOUNDATION OF ANALYSIS—3 cr. (3 and 0)
An introduction to the language and use of symbolic logic and the properties of the real number system with applications to the calculus. *Prerequisite:* Math 108.

MATH 301—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)
Principal topics include: elementary probability theory, discrete and continuous random variables, expected values, normal distribution, chi-square distribution, t-distribution, F-distribution, test of hypothesis, point and interval estimation, curve fitting. *Prerequisite:* Math 206.

MATH H301—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)
Same as Math 301 except that this honors section is open to students only by invitation.

MATH 308—COLLEGE GEOMETRY—3 cr. (3 and 0)
Theorems and concepts more advanced than those of high school geometry. A treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Prerequisite:* Math 106.

MATH 309—ENGINEERING MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math 208. An introduction to Fourier Series, numerical methods, partial differential equations and certain special functions is given. *Prerequisite:* Math 208.

MATH H309—ENGINEERING MATHEMATICS II—3 cr. (3 and 0)
Same as Math 309 except that this honors section is open to students only by invitation.

MATH 402—THEORY OF PROBABILITY—3 cr. (3 and 0)
Principal topics include: combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. *Prerequisite:* Math 301 or consent of instructor.

MATH H402—THEORY OF PROBABILITY—3 cr. (3 and 0)
Same as Math 402 except that this honors section is open to students only by invitation.

MATH 403—STATISTICAL INFERENCE—3 cr. (3 and 0)
Principal topics include: sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypothesis, likelihood ration methods, regression and correlation analysis, introduction to analysis of variance. *Prerequisite:* Math 402.

MATH H403—STATISTICAL INFERENCE—3 cr. (3 and 0)
Same as Math 403 except that this honors section is open to students only by invitation.

MATH 404—INTRODUCTION TO STOCHASTIC PROCESSES—3 cr. (3 and 0)
Principal topics include—random variables, counting processes, stationary processes, ergodic processes, spectral distribution function, examples from scientific fields to indicate the use of stochastic processes in construction of models of physical and behavioral phenomena. *Prerequisite:* Math 402.

MATH 405—STATISTICAL THEORY AND METHODS II—3 cr. (3 and 0)
Principal topics include contingency tables, goodness of fit, rank-sum tests. Kolmogorov-Smirnov tests, analysis of variance, factoral experimentation, applications to reliability and life testing, applications to quality assurance. *Prerequisite:* Math 301.

MATH 407—PARTIAL DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)
Partial differentiation and space geometry, origins of partial differential equations, linear and nonlinear equations of the first order, Fourier series, linear equations of the second and higher orders. *Prerequisite:* Math 208.

MATH 408—TOPICS IN GEOMETRY—3 cr. (3 and 0)
An introduction to topics in special geometries which include non-Euclidean space concepts, such as projective geometry, finite geometries, and intuitive elementary topology. A brief introduction to vector geometry. *Prerequisite:* Math 206.

MATH 409—STATISTICAL THEORY AND METHODS III—3 cr. (3 and 0)
A continuation of Math 405 with equal emphasis on both the mathematical foundations and practical applications of advanced statistical methods. Principal topics include: experimental designs, fractionally replicated experiments, multiple regression and response surface analysis, evolutionary operations, simultaneous inference, analysis of covariance, and time series analysis. *Prerequisite:* Math 405.

MATH 411—LINEAR ALGEBRA—3 cr. (3 and 0)
An introduction to the algebra of matrices, vector spaces, polynomials and linear transformations. *Prerequisite:* Math 206.

MATH 412—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)
An introduction to the concepts of algebra. Topics included are the number system; elementary theory of groups; rings, integral domains, and fields; matrices over a field; determinants and matrices; groups, rings, and ideals. *Prerequisite:* Math 206.

MATH H412—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)
Same as Math 412 except that this honors section is open to students only by invitation.

MATH 413—MODERN ALGEBRA—3 cr. (3 and 0)
A continuation of Math 412.

MATH H413—MODERN ALGEBRA—3 cr. (3 and 0)
Same as Math 413 except that this honors section is open to students only by invitation.

MATH 415—INTRODUCTION TO TOPOLOGY—3 cr. (3 and 0)
An introduction to point set topology; Hausdorff, regular and normal spaces; metric connected and compact spaces; continuous mappings and homeomorphisms. *Prerequisite:* Math 295.

MATH H415—INTRODUCTION TO TOPOLOGY—3 cr. (3 and 0)
Same as Math 415 except that this honors section is open to students only by invitation.

MATH 417—MATHEMATICS PROGRAMS—3 cr. (3 and 0)
Aspects of the new programs in mathematics. Open only to in-service teachers or students in the Mathematics Teacher Training Program. *Prerequisite:* Math 308; *corequisite:* Math 408.

MATH 419—APPLIED COMBINATORIAL ALGEBRA I—3 cr. (3 and 0)
This course applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, hemomorphisms, and permutation groups to computer characterization and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. Computer algorithms for listing permutations, combinations, compositions, and partitions and for representation and processing of digital information are considered. *Prerequisite:* Math 206.

MATH 420—APPLIED COMBINATORIAL ALGEBRA II—3 cr. (3 and 0)
This course applies graph theory, ring and field theory, cardinality of sets, and difference equations to Nim games and other perfect information games, transport networks, shortest route problems, polynomial codes, Bose-Chandhuri-Hoquenghem codes, machine computability, mathematical linguistics, classification of programming languages, and different codes. *Prerequisite:* Math 412, or 419, or consent of instructor.

MATH 422—MATHEMATICAL LOGIC—3 cr. (3 and 0)
A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Sufficient mathematical background.

MATH 424—FOUNDATIONS OF MATHEMATICS—3 cr. (3 and 0)
Naive set theory, cardinal and ordinal numbers, and axiom of choice and equivalents. A study of the set theoretic fundamentals of abstract mathematics.

MATH 425—INTERMEDIATE DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)
Second order linear differential equations, regular singular points, Bessel, Legendre and hypergeometric functions, general linear equations, existence and uniqueness theorems, plane autonomous systems and phase plane concepts, Sturm-Louville systems. *Corequisite:* Advanced calculus.

MATH 428—NUMERICAL LINEAR ALGEBRA—3 cr. (3 and 0)
Numerical solution of linear algebraic systems, matrix inversion, computation of eigenvalues and eigenvectors. *Prerequisite:* Comp Sc 205, Math 411.

MATH 429—NUMERICAL ANALYSIS I—3 cr. (3 and 0)
Solution of nonlinear equations and systems, function approximation with polynomials, numerical differentiation and quadrature, numerical solution of ordinary differential equations. *Prerequisite:* Comp Sc 205, Math 453 or 463.

MATH 435—COMPLEX VARIABLES—3 cr. (3 and 0)
Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping. Schwartz-Christoffel transformation. *Prerequisite:* Math 453 or 463.

MATH H435—COMPLEX VARIABLES—3 cr. (3 and 0)
Same as Math 435 except that this honors section is open to students only by invitation.

MATH 452—LINEAR PROGRAMMING—3 cr. (3 and 0)
An introduction to linear programming, using elementary matrix algebra and the theory of convex polygons. Applications to managerial problems, operations research, economic behavior, the theory of games and military strategy are considered. *Prerequisite:* Math 206 or permission of instructor.

MATH 453—ADVANCED CALCULUS I—3 cr. (3 and 0)
Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Prerequisite:* Math 208 and Junior standing.

MATH 454—ADVANCED CALCULUS II—3 cr. (3 and 0)
A continuation of Math 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals.

MATH 457—APPLIED MATHEMATICS I—3 cr. (3 and 0)
Determinants and matrices, review of differential equations, finite differences, Fourier series and integrals, Laplace transformations, a large selection of applications. *Prerequisite:* Math 208.

MATH 458—APPLIED MATHEMATICS II—3 cr. (3 and 0)
A continuation of Math 457. Partial differential equations, Bessel functions and Legendre polynomials, analytic functions of complex variables, infinite series in a complex plane, the theory of residues, conformal mapping. *Prerequisite:* Math 457.

MATH 463—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)
Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. *Prerequisite:* Math 295.

MATH H463—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)
Same as Math 463 except that this honors section is open to students only by invitation.

MATH 464—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Math 463.

MATH H464—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)
A continuation of Math H463. This honors section is open to students only by invitation.

MATH 471—APPLIED STATISTICAL DECISION THEORY—3 cr. (3 and 0)
An introduction to statistical decision theory emphasizing the Bayesian approach. Behavioral axioms, characterizing the "Rational decision maker," lead to the laws of probability theory and utility theory. Topics include: axioms of subjective probability and utility, extensive and normal form analysis, likelihood principle, conjugate distributions. *Prerequisite:* Math 402.

MATH 473—INTRODUCTION TO NONLINEAR OPTIMIZATION—3 cr. (3 and 0)
An introduction to the application and theory of nonlinear optimization problems. The primary topics include: classical optimization based on the calculus, approximation techniques, separable programming, quadratic programming, gradient methods, and dynamic programming. *Prerequisite:* Math 452, 453.

MATH H481—HONORS SEMINAR IN MATHEMATICS—Credit to be arranged. (3 and 0)
At the discretion of the instructor, attention will be focused upon mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis will be upon independent study and student use of previously acquired mathematical skills and his own ingenuity in the examination, presentation or preparation of mathematical papers. These papers may be expository or creative in content and may deal with applications of the mathematics under investigation. This honors course is open to students only by invitation for not more than three hours credit.

MATH H482—HONORS SEMINAR IN MATHEMATICS—Credit to be arranged. (3 and 0)
A continuation of Math H481.

MATH 601—STATISTICAL THEORY AND METHODS I—3 cr. (3 and 0)

MATH 602—THEORY OF PROBABILITY—3 cr. (3 and 0)

MATH 603—STATISTICAL INFERENCE—3 cr. (3 and 0)

MATH 604—INTRODUCTION TO STOCHASTIC PROCESSES—3 cr. (3 and 0)

MATH 605—STATISTICAL THEORY AND METHODS II—3 cr. (3 and 0)

MATH 607—PARTIAL DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 608—TOPICS IN GEOMETRY—3 cr. (3 and 0)

MATH 609—STATISTICAL THEORY AND METHODS III—3 cr. (3 and 0)

MATH 611—LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 612—INTRODUCTION TO MODERN ALGEBRA—3 cr. (3 and 0)

MATH 613—MODERN ALGEBRA—3 cr. (3 and 0)

MATH 615—INTRODUCTION TO TOPOLOGY—3 cr. (3 and 0)

MATH 617—MATHEMATICS PROGRAMS—3 cr. (3 and 0)

MATH 619—APPLIED COMBINATORIAL ALGEBRA I—3 cr. (3 and 0)

MATH 620—APPLIED COMBINATORIAL ALGEBRA II—3 cr. (3 and 0)

MATH 625—INTERMEDIATE DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 628—NUMERICAL LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 629—NUMERICAL ANALYSIS I—3 cr. (3 and 0)

MATH 635—COMPLEX VARIABLES—3 cr. (3 and 0)

MATH 652—LINEAR PROGRAMMING—3 cr. (3 and 0)

MATH 653—ADVANCED CALCULUS I—3 cr. (3 and 0)

MATH 654—ADVANCED CALCULUS II—3 cr. (3 and 0)

MATH 657—APPLIED MATHEMATICS I—3 cr. (3 and 0)

MATH 658—APPLIED MATHEMATICS II—3 cr. (3 and 0)

MATH 663—MATHEMATICAL ANALYSIS I—3 cr. (3 and 0)

MATH 664—MATHEMATICAL ANALYSIS II—3 cr. (3 and 0)

MATH 671—APPLIED STATISTICAL DECISION THEORY—3 cr. (3 and 0)

MATH 673—INTRODUCTION TO NONLINEAR OPTIMIZATION—3 cr. (3 and 0)

MATH 701—NUMBER SYSTEMS—3 cr. (3 and 0)

MATH 703—GEOMETRIC CONCEPTS—3 cr. (3 and 0)

MATH 705—ALGEBRA, PROBABILITY AND STATISTICS—3 cr. (3 and 0)

MATH 711—MODERN ALGEBRAIC CONCEPTS I—3 cr. (3 and 0)

MATH 712—MODERN ALGEBRAIC CONCEPTS II—3 cr. (3 and 0)

MATH 721—MATRIX ALGEBRA I—3 cr. (3 and 0)

MATH 722—MATRIX ALGEBRA II—3 cr. (3 and 0)

MATH 731—NON-EUCLIDEAN GEOMETRY—3 cr. (3 and 0)

MATH 741—INTRODUCTION TO LINEAR PROGRAMMING WITH APPLICATIONS—3 cr. (3 and 0)

MATH 751—FUNDAMENTAL CONCEPTS OF CALCULUS I—3 cr. (3 and 0)

MATH 752—FUNDAMENTAL CONCEPTS OF CALCULUS II—3 cr. (3 and 0)

MATH 761—PROBABILITY AND STATISTICS—3 cr. (3 and 0)

MATH 801—GENERAL LINEAR HYPOTHESIS I—3 cr. (3 and 0)

MATH 802—GENERAL LINEAR HYPOTHESIS II—3 cr. (3 and 0)

MATH 803—STOCHASTIC PROCESSES I—3 cr. (3 and 0)

MATH 804—STOCHASTIC PROCESSES II—3 cr. (3 and 0)

MATH 807—MATHEMATICAL STATISTICS I—3 cr. (3 and 0)

MATH 808—MATHEMATICAL STATISTICS II—3 cr. (3 and 0)

MATH 811—NONLINEAR PROGRAMMING—3 cr. (3 and 0)

MATH 812—DYNAMIC PROGRAMMING—3 cr. (3 and 0)

MATH 813—ADVANCED LINEAR PROGRAMMING—3 cr. (3 and 0)

MATH 821—REAL ANALYSIS I—3 cr. (3 and 0)

MATH 822—REAL ANALYSIS II—3 cr. (3 and 0)

MATH 823—COMPLEX ANALYSIS I—3 cr. (3 and 0)

MATH 824—COMPLEX ANALYSIS II—3 cr. (3 and 0)

MATH 825—ORDINARY DIFFERENTIAL EQUATIONS I—3 cr. (3 and 0)

MATH 826—ORDINARY DIFFERENTIAL EQUATIONS II—3 cr. (3 and 0)

MATH 831—FOURIER SERIES—3 cr. (3 and 0)

MATH 833—OPERATIONAL MATHEMATICS—3 cr. (3 and 0)

MATH 837—CALCULUS OF VARIATIONS—3 cr. (3 and 0)

MATH 839—INTEGRAL EQUATIONS—3 cr. (3 and 0)

MATH 841—APPLIED MATHEMATICS I—3 cr. (3 and 0)

MATH 842—APPLIED MATHEMATICS II—3 cr. (3 and 0)

MATH 851—ABSTRACT ALGEBRA I—3 cr. (3 and 0)

MATH 852—ABSTRACT ALGEBRA II—3 cr. (3 and 0)

MATH 853—ADVANCED LINEAR ALGEBRA—3 cr. (3 and 0)

MATH 854—THEORY OF GRAPHS I—3 cr. (3 and 0)

MATH 855—COMBINATORIAL ANALYSIS—3 cr. (3 and 0)

MATH 861—ADVANCED NUMERICAL ANALYSIS I—3 cr. (3 and 0)

MATH 862—ADVANCED NUMERICAL ANALYSIS II—3 cr. (3 and 0)

MATH 863—DIGITAL ANALYSIS I—3 cr. (3 and 0)

MATH 864—DIGITAL ANALYSIS II—3 cr. (3 and 0)

MATH 871—GENERAL TOPOLOGY I—3 cr. (3 and 0)

MATH 872—GENERAL TOPOLOGY II—3 cr. (3 and 0)

MATH 873—ALGEBRAIC TOPOLOGY I—3 cr. (3 and 0)

MATH 874—ALGEBRAIC TOPOLOGY II—3 cr. (3 and 0)

MATH 875—CONVEXITY I—3 cr. (3 and 0)

MATH 876—CONVEXITY II—3 cr. (3 and 0)

MATH 881—HISTORY OF MATHEMATICS—3 cr. (3 and 0)

MATH 883—THEORY OF NUMBERS—3 cr. (3 and 0)

MATH 885—PROJECTIVE GEOMETRY—3 cr. (3 and 0)

MATH 891—RESEARCH—Credit to be arranged.

MATH 901—PROBABILITY THEORY I—3 cr. (3 and 0)

MATH 902—PROBABILITY THEORY II—3 cr. (3 and 0)

MATH 903—ADVANCED STOCHASTIC PROCESSES—3 cr. (3 and 0)

MATH 905—DECISION THEORY I—3 cr. (3 and 0)

MATH 906—DECISION THEORY II—3 cr. (3 and 0)

MATH 907—MULTIVARIATE ANALYSIS—3 cr. (3 and 0)

MATH 920—INTRODUCTION TO HARMONIC ANALYSIS—3 cr. (3 and 0)

MATH 921—ABSTRACT HARMONIC ANALYSIS I—3 cr. (3 and 0)

MATH 922—ABSTRACT HARMONIC ANALYSIS II—3 cr. (3 and 0)

MATH 923—INTRODUCTION TO THE THEORY OF DISTRIBUTION I—3 cr. (3 and 0)

MATH 924—INTRODUCTION TO THE THEORY OF DISTRIBUTION II—3 cr. (3 and 0)

MATH 925—TOPICS IN NONLINEAR DIFFERENTIAL EQUATIONS—3 cr. (3 and 0)

MATH 927—FUNCTIONAL ANALYSIS I—3 cr. (3 and 0)

MATH 928—FUNCTIONAL ANALYSIS II—3 cr. (3 and 0)

MATH 929—FUNCTIONAL ANALYSIS III—3 cr. (3 and 0)

MATH 930—FUNCTIONAL ANALYSIS IV—3 cr. (3 and 0)

MATH 945—POTENTIAL THEORY I—3 cr. (3 and 0)

MATH 946—POTENTIAL THEORY II—3 cr. (3 and 0)

MATH 951—GROUP THEORY—3 cr. (3 and 0)

MATH 952—RING THEORY I—3 cr. (3 and 0)

MATH 953—RING THEORY II—3 cr. (3 and 0)

MATH 954—THEORY OF GRAPHS II—3 cr. (3 and 0)

MATH 955—COMBINATORIAL ANALYSIS II—3 cr. (3 and 0)

MATH 956—FIELD THEORY—3 cr. (3 and 0)

MATH 957—SEMIGROUP THEORY I—3 cr. (3 and 0)

MATH 958—SEMIGROUP THEORY II—3 cr. (3 and 0)

MATH 980—SPECIAL TOPICS IN PROBABILITY—1-3 cr. (1-3 and 0)

MATH 981—SPECIAL TOPICS IN MATHEMATICAL STATISTICS—1-3 cr. (1-3 and 0)

MATH 982—SPECIAL TOPICS IN ANALYSIS—1-3 cr. (1-3 and 0)

MATH 983—SPECIAL TOPICS IN FUNCTIONAL ANALYSIS—1-3 cr. (1-3 and 0)

MATH 984—SPECIAL TOPICS IN APPLIED MATHEMATICS—1-3 cr. (1-3 and 0)

MATH 985—SPECIAL TOPICS IN ALGEBRA—1-3 cr. (1-3 and 0)

MATH 986—SPECIAL TOPICS IN CONVEXITY—1-3 cr. (1-3 and 0)

MATH 987—SPECIAL TOPICS IN NUMERICAL PROCESSES—1-3 cr. (1-3 and 0)

MATH 991—DOCTORAL RESEARCH—Credit to be arranged.

MECHANICAL ENGINEERING

Professors: D. W. Bradbury, J. L. Edwards, T. C. Hardin, E. Harrison, A. D. Lewis, S. M. Watson, T. Yang

Associate Professors: C. A. Brandon, E. F. Coxe, A. C. Elrod, J. C. Hester, *Head;* W. G. Hudson, J. K. Johnson, Jr., D. W. Lyons, C. S. Rudisill

Assistant Professor: M. W. Dixon

Adjunct Professor: T. S. Hargest

ME 201—Innovative Design I—2 cr. (1 and 3)

An introduction to engineering design with emphasis on creativity, synthesis, participation in a realistic experience in design to satisfy human needs, experimentation and analysis commensurate with the student's background in mathematics and science. Problems are authentic. The building of a prototype, at least of critical parts, is the consummation of the design. Nontechnical aspects of engineering such as cost, market, contracts, and ethics are stressed. *Corequisite:* Phys 122 and Sophomore standing.

ME 202—Innovative Design II—2 cr. (1 and 3)

A continuation of ME 201 to involve the student in the implementation of design concepts. Graphical communication, engineering materials, methods of production and design trade-offs are presented. *Prerequisite:* ME 201 and consent of instructor.

ME 299—Digital Computation—1 cr. (0 and 3)

An introduction to digital computer programming for students majoring in mechanical engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in mechanical engineering. *Prerequisite:* Sophomore standing.

ME 304—Heat Transfer I—3 cr. (3 and 0)

A comprehensive study of the principles of heat transmission with applications to engineering problems. Special emphasis is given to the following topics: heat conduction in the steady and unsteady states; dimensional analysis of convection; free and forced convection; the combined efforts of conduction, convection and radiation. *Prerequisite:* Junior standing, ME 311, or ChE 331, Math 208, and permission of instructor.

ME 311—Engineering Thermodynamics I—3 cr. (3 and 0)

A study of thermodynamics as an engineering science. Topics stressed are the first and second laws of thermodynamics, properties of the pure substance, ideal gases, and gaseous mixtures. *Prerequisite:* Math 208, Phys 222, and Junior standing.

ME H311—Engineering Thermodynamics I—3 cr. (3 and 0)

Honors section of ME 311; admission by invitation.

ME 312—Engineering Thermodynamics II—3 cr. (3 and 0)

Chemical reactions and combustion, chemical equilibrium; analyses of processes and cycles; introduction to statistical thermodynamics, kinetic theory of gases, and irreversible thermodynamics. *Prerequisite:* ME 311.

ME 313—Instrumentation and Measurements—2 cr. (1 and 2)

Principles of measurements, accuracy of instruments, and data acquisition. Modern instruments for measuring and recording static and dynamic pressures, temperatures, fluid flow, speed, power, and torque. *Prerequisite:* Enrollment in ME 311.

ME 314—ENGINEERING EXPERIMENTATION—2 cr. (1 and 2)
Theoretical, analytic and statistical aspects of basic engineering experimentation. Error analysis, dimensional analysis, experimental plans, and data analyses. *Prerequisite:* Math 301, ME 313, and permission of instuctor.

ME 316—DYNAMIC SYSTEM ANALYSIS—4 cr. (3 and 3)
Principles of dynamic system response with emphasis on the determination of mathematical models for mechanical, electrical, electomechanical, fluid and thermal systems. Differential equations are developed from a consideration of physical laws, system arrangement, and constraints. The Lagrangian state function and Lagrange's equation are introduced. Transient and steady-state analyses make use of Laplace transforms and frequence response techniques. Computers are used extensively. *Prerequisite:* Math 208, Phys 221, EM 202. *Corequisite:* E&CE 331.

ME 321—FLUID DYNAMICS—3 cr. (3 and 0)
A study of the theory of fluids in motion. Topics include: review of concepts from thermodynamics as applied to the governing equations of fluids in motion; wave propagation in a fluid; types of fluid flow; one dimensional adiabatic flow with variable area; normal and oblique shocks and expansion fans; attached and detached shocks; shock-boundary layer interaction; one dimensional flow with friction and heat transfer; introduction to viscous flow theory; introduction to potential flow theory; selected applications. *Prerequisite:* EM 320, ME 311, and permission of instructor.

ME 401—PRINCIPLES OF MECHANICAL ENGINEERING DESIGN—3 cr. (3 and 0)
Stress, strain and strength considerations in engineering design. Theories of failure of yielding, brittle fracture and fatigue fracture are presented. Design considerations for impact, creep, elastic deflection, stress concentration, contact stresses and reliability are studied. Engineering problems are assigned to implement applications of principles of design. *Prerequisite:* EM 304, ME 316, and permission of instructor. *Corequisite:* CrE 310, Senior standing.

ME 402—INNOVATIVE DESIGN III—2 cr. (1 and 2)
The student is given the opportunity to apply creatively his general knowledge and his knowledge of engineering in the analysis and design of one or more engineering systems, machines, or devices. Problems may be selected from two sources: A meritorious problem of the student's own choice or a problem assigned by appropriate authority. *Corequisite:* ME 401, Senior standing, and permission of instructor.

ME 404—AUTOMATIC CONTROL—3 cr. (3 and 0)
Mathematical modeling of automatic control systems; concepts of state variable observability and controllability. System analysis with emphasis on classical frequency domain and root locus techniques. Introduction to design with applications to mechanical, electromechanical, hydraulic, and pneumatic systems. *Prerequisite:* ME 316, E&CE 308, and permission of instructor.

ME 406—PHYSICAL SYSTEMS ANALYSIS AND DESIGN—3 cr. (3 and 0)
A general approach to the analysis and synthesis of physical systems based on state variable representation, Lagrange's equations, matrix solution to state

equations, and the calculus of variations. Computer solutions are obtained for application to mechanical, electrical, fluid, and thermal systems. *Prerequisite:* ME 316, and permission of instructor.

ME 408—INTRODUCTION TO COMPUTER-AIDED DESIGN—3 cr. (3 and 0)
Introduction to computer-aided design, reliability, figures of merit, optimization techniques, search for extremes, and decision theory in design. Computer-aided optimum design of engineering systems and the writing and use of problem-oriented languages will be emphasized. *Prerequisite:* Senior standing.

ME 411—GAS POWER—3 cr. (3 and 0)
A study of the effects of variation in specific heat, some fundamentals of compressible flow, the combustion process, and chemical dissociation. The theoretical and actual processes associated with the gas turbine, the thermal jet, the thermal rocket, and the spark ignition and compression ignition reciprocating engines are analyzed. *Prerequisite:* ME 312 and Senior engineering.

ME 412—APPLIED THERMODYNAMICS—3 cr. (3 and 0)
Basic principles of first and second laws of thermodynamics applied to areas such as cryogenics, nonconventional energy conversion process, industrial process heat and electric power systems, etc. *Prerequisite:* ME 312, and permission of instructor.

ME 413—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
Experimental investigations in a wide variety of mechanical engineering areas, such as fluid dynamics, automatic control, heat and mass transfer, combustion, thermodynamics, and solid mechanics. *Prerequisite:* ME 313, 314, and permission of instructor.

ME 414—MECHANICAL ENGINEERING LABORATORY—1 cr. (0 and 2)
Continuation of ME 413.

ME 415—UNDERGRADUATE RESEARCH—1-3 cr.
Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Permission of instructor.

ME H415—UNDERGRADUATE RESEARCH—1-3 cr.
Honors section of ME 415; admission by invitation.

ME 416—UNDERGRADUATE RESEARCH—1-3 cr.
Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Consent of instructor.

ME 422—PRINCIPLES OF TURBOMACHINERY—3 cr. (3 and 0)
The guiding principles underlying all forms of turbomachinery. A unified treatment of turbomachinery to include pumps, fans, compressors and steam, gas and hydraulic turbines. Dimensional analysis as applied to turbomachinery, Euler's Equation, concepts of specific speed and thermodynamics of turbomachinery processes and allied topics are covered. *Prerequisite:* ME 312, EM 320, Senior standing, and permission of instructor.

ME 424—ENGINEERING ANALYSIS—3 cr. (2 and 3)
A senior-level course requiring the student to utilize his knowledge of mathematics, fluid and solid mechanics, thermodynamics, heat transfer, and other background work in solving engineering problems. Both analog and digital computers are utilized as tools contributing to these solutions. *Prerequisite:* ME 304, 312, EM 321, and permission of instructor.

ME 425—KINEMATICS I: KINEMATIC ANALYSIS OF MACHINES—3 cr. (3 and 0)

Kinematic analysis of machines to include displacement, velocity and acceleration analyses. Kinematic design of gears, cams and linkages, trains of mechanisms. Space mechanisms. Linkage synthesis. Analog and digital computers are used. *Prerequisite:* EM 202, ME 316, and permission of instructor.

ME 429—AIR-CONDITIONING—3 cr. (0 and 3)

A study of the principles of heating and air conditioning, including calculation of heat loss and heat gains for buildings, heating and cooling systems, psychrometric principles, air distribution, refrigeration and automatic control apparatus. *Prerequisite:* ME 304, 312, Senior standing, and permission of instructor.

ME 430—AIR-CONDITIONING DESIGN—1 cr. (0 and 3)

An application of the theory covered in ME 429 to the design of air-conditioning systems. *Prerequisite:* Enrollment in ME 429.

ME 441—AEROELASTICITY—3 cr. (3 and 0)

Two- and three-dimensional theory of structural vibration and wing flutter. Lagrangian equations, energy methods, matrix methods and computer techniques for vibration analysis will be presented. Structural damping, aerodynamic forces, and flutter stability will be studied. Vertical bending, torsional vibration and flutter of fuselages, ailerons and stabilizers will be analyzed.

ME 480—METHODS OF OPERATIONS RESEARCH I—3 cr. (3 and 0)

Applications and elementary theory of selected topics from Operations Research. Topics included are linear algebra, linear programming, transportation and assignment problems, network analysis, and game theory. *Prerequisite:* ME 299 or equivalent.

ME 481—METHODS OF OPERATIONS RESEARCH II—3 cr. (3 and 0)

A continuation of ME 480. Topics included are nonlinear programming, dynamic programming, queuing theory, and markov processes. *Prerequisite:* Math 301 or equivalent.

ME 484—ENGINEERING ECONOMIC ANALYSIS—3 cr. (3 and 0)

Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness. *Prerequisite:* Senior standing in Engineering or consent of instructor.

ME 485—INDUSTRIAL APPLICATION OF STATISTICS—3 cr. (3 and 0)

Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability and analysis, and machine interference. *Prerequisite:* Math 301.

ME 486—WORK FLOW SYSTEMS AND CONTROL—3 cr. (3 and 0)

Fundamentals underlying the determination of production capacity requirements, economic lot sizes, and the regulating of flow and storage of materials to, within, and from the production system. Elements of forecasting, determination of materials requirements, scheduling, inventory control, etc. Consideration of data processing methods. *Prerequisite:* Math 301, consent of instructor.

ME 491—SELECTED TOPICS IN MECHANICAL ENGINEERING—3 cr. (3 and 0) A comprehensive study of any topic in the field of Mechanical Engineering not covered in other courses.

ME 601—PRINCIPLES OF MECHANICAL ENGINEERING DESIGN—3 cr. (3 and 0)

ME 602—INNOVATIVE DESIGN III—2 cr. (1 and 2)

ME 604—AUTOMATIC CONTROL—3 cr. (3 and 0)

ME 606—PHYSICAL SYSTEMS ANALYSIS AND DESIGN—3 cr. (3 and 0)

ME 608—INTRODUCTION TO COMPUTER-AIDED DESIGN—3 cr. (3 and 0)

ME 611—GAS POWER—3 cr. (3 and 0)

ME 622—PRINCIPLES OF TURBOMACHINERY—3 cr. (3 and 0)

ME 624—ENGINEERING ANALYSIS—3 cr. (3 and 0)

ME 625—KINEMATICS I: KINEMATIC ANALYSIS OF MACHINES—3 cr. (3 and 0)

ME 680—METHODS OF OPERATIONS RESEARCH I—3 cr. (3 and 0)

ME 681—METHODS OF OPERATIONS RESEARCH II—3 cr. (3 and 0)

ME 684—ENGINEERING ECONOMIC ANALYSIS—3 cr. (3 and 0)

ME 801—THERMAL ENVIRONMENTAL ENGINEERING—3 cr. (3 and 0)

ME 810—ADVANCED THERMODYNAMICS—3 cr. (3 and 0)

ME 811—GAS DYNAMICS—3 cr. (3 and 0)

ME 813—ADVANCED GAS DYNAMICS—3 cr. (3 and 0)

ME 815—KINETIC THEORY OF GASES—3 cr. (3 and 0)

ME 816—ENERGY CONVERSION—3 cr. (3 and 0)

ME 824—PROPULSION SYSTEMS—3 cr. (3 and 0)

ME 830—HEAT TRANSFER—3 cr. (3 and 0)

ME 831—HEAT AND MASS TRANSFER—3 cr. (3 and 0)

ME 840—KINEMATICS II—3 cr. (3 and 0)

ME 842—ADVANCED MECHANICAL ENGINEERING DESIGN I—3 cr. (3 and 0)

ME 843—ADVANCED MECHANICAL ENGINEERING DESIGN II—3 cr. (3 and 0)

ME 845—ACOUSTICS—3 cr. (3 and 0)

ME 850—ADVANCED DYNAMIC SYSTEMS AND CONTROL—3 cr. (3 and 0)

ME 860—DYNAMIC PROGRAMMING—3 cr. (3 and 0)

ME 861—NONLINEAR PROGRAMMING—3 cr. (3 and 0)

ME 862—ANALYTICAL METHODS OF SYSTEMS ANALYSIS—3 cr. (3 and 0)

ME 863—ADVANCED PHYSICAL SYSTEMS ANALYSIS I—3 cr. (3 and 0)

ME 864—ADVANCED PHYSICAL SYSTEMS ANALYSIS II—3 cr. (3 and 0)

ME 865—MODERN CONTROL THEORY I—3 cr. (3 and 0)

ME 866—NONLINEAR AUTOMATIC CONTROLS—3 cr. (3 and 0)

ME 867—CONTROL SYSTEM COMPONENTS—3 cr. (3 and 0)

ME 868—CONTROL OF AEROSPACE SYSTEMS—3 cr. (3 and 0)

ME 880—METHODS OF OPERATIONS RESEARCH I—3 cr. (3 and 0)

ME 881—ADVANCED METHODS OF OPERATIONS RESEARCH II—3 cr. (3 and 0)

ME 882—RELIABILITY ENGINEERING—3 cr. (3 and 0)

ME 883—OPERATIONS SYSTEM SIMULATION I—3 cr. (3 and 0)

ME 884—OPERATIONS SYSTEM SIMULATION II—3 cr. (3 and 0)

ME 885—DESIGN AND ANALYSIS OF SIMULATION MODELS—3 cr. (3 and 0)

ME 886—OPERATIONS RESEARCH IN PRODUCTION CONTROL I—3 cr. (3 and 0)

ME 887—OPERATIONS RESEARCH IN PRODUCTION CONTROL II—3 cr. (3 and 0)

ME 888—APPLIED QUEUEING THEORY AND MARKOV PROCESSES—3 cr. (3 and 0)

ME 891—RESEARCH—Credit to be arranged.

ME 893—SELECTED TOPICS IN MECHANICAL ENGINEERING—1-6 cr. (1-6 and 0)

ME 894—SEMINAR—1 cr. (1 and 0)

ME 914—MAGNETOHYDRODYNAMICS—3 cr. (3 and 0)

ME 915—ENERGY CONVERSION—3 cr. (3 and 0)

ME 930—CONDUCTION HEAT TRANSFER—3 cr. (3 and 0)

ME 931—CONVECTION HEAT TRANSFER—3 cr. (3 and 0)

ME 932—RADIATION HEAT TRANSFER—3 cr. (3 and 0)

ME 940—APPLIED PLASTICITY—3 cr. (3 and 0)

ME 941—THEORY OF LUBRICATION AND WEAR—3 cr. (3 and 0)

ME 991—DOCTORAL RESEARCH—Credit to be arranged.

MEDICAL TECHNOLOGY

Anderson—*Lecturers:* J. W. BLACK, R. E. JONES, JR., N. L. LONG
Teaching Supervisor: KAY LITTLE

Greenville—*Lecturers:* E. C. COX, E. A. DRESKIN, D. G. KILGORE, JR., J. H. MCCARTER, W. M. WATERS
Teaching Supervisor: PATRICIA THOMPSON

MED TECH 101—AN INTRODUCTION TO MEDICAL TECHNOLOGY—1 cr. (1 and 0)

An introduction to the operation and practices in a medical laboratory. This course is designed to integrate the academic year with the clinical year. Included will be lectures on current laboratory practices, a visit to a modern medical laboratory, current training of laboratory personnel and seminars on areas of specialization.

MED TECH 401—SEROLOGY AND IMMUNOLOGY—4 cr. (21,10,49)*
Presents the basic principles of serology and immunology and the tests utilizing these principles to detect abnormalities helpful in the diagnosis of disease.

MED TECH 402—MICROBIOLOGY—7 cr. (59,6,470)
The principles of microbiology-bacteriology, mycology, and parasitology. Emphasis is placed on human pathogenic organisms, using both fresh and prepared organisms.

MED TECH 403—HEMATOLOGY—5 cr. (12,32,276)
Information on blood as a tissue, the theory of hematological tests, factors that affect test reliability. Knowledge of test results and knowledge of blood dyscrasias. Skill in the performance of hematological tests is emphasized and the use of automation techniques is covered.

MED TECH 404—BLOOD BANK—3 cr. (8,20,132)
History and principles of blood group systems and methods of cross matching. Testing for, and quantitative determination of, Rh antibodies with all available techniques. Selection, pretesting and bleeding of donors and processing of blood for transfusions.

MED TECH 405—CYTOLOGY—1 cr. (2,12,26)
An introduction to cytology and cytologic techniques in the diagnosis of cancer. Definition and brief history, sources of material, collection and preservation of specimens, together with practice in interpretation.

MED TECH 406—HISTOLOGY—3 cr. (20,30,190)
Histologic preparation, including actual preparation of tissue specimens derived from surgical procedures and autopsies. Routine and special training, together with experience using the Cryostat.

MED TECH 407—URINALYSIS—2 cr. (10,8,102)
The study of renal function together with principles of urine analysis, pregnancy tests and anatomy of the urinary system. Emphasis is placed on laboratory procedures and their utilization to detect abnormalities helpful in the diagnosis of disease.

MED TECH 408—CHEMISTRY—10 cr. (40,50,470)
Introduction to the chemistry of carbohydrates, nitrogen, calcium, and phosphorus compounds, acid-base balance, etc., with emphasis on the chemistry of blood and urine using both qualitative and quantitative procedures in the laboratory.

MED TECH 409—RADIOISOTOPES—1 cr. (2,0,7)
Introduction to principles of diagnostic radioisotope procedures and the use of the scintillation detector, the well counter, and the scaler.

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* First figure represents lecture hours, second figure represents seminar hours, and the third figure represents clinical practice hours.

MICROBIOLOGY

(See also Biology)

Professor: R. K. GUTHRIE

Associate Professors: ANN W. BAXTER, J. H. BOND, M. J. B. PAYNTER, *Head*

MICRO 305—GENERAL MICROBIOLOGY—4 cr. (3 and 3) F, S, SS

Morphology, physiology, classification, distribution, and cultivation of microorganisms and health. *Prerequisite:* Bot 102, or Zool 102, 104, Ch 101, 102 or 112.

MICRO 401—ADVANCED BACTERIOLOGY—4 cr. (2 and 6) F

Metabolism, nutrition, growth, and death of bacteria; microbiological assays and industrial fermentation; emphasis on laboratory procedures for the identification of the more common taxonomic groups. *Prerequisite:* Micro 305; Ch 201, or 223, and 227.

MICRO H401—ADVANCED BACTERIOLOGY—4 cr. (2 and 6) F

Honors option for Micro 401; admission by special arrangement.

MICRO 402—DAIRY MICROBIOLOGY—3 cr. (2 and 3)
S, '70 and alternate years.

Morphology, physiology, and culturing of microorganisms of importance in dairy products; standard methods for the determination of numbers of bacteria, yeasts, and molds in various dairy products. *Prerequisite:* Micro 305.

MICRO H402—DAIRY MICROBIOLOGY—3 cr. (2 and 3)
S, '70 and alternate years.

Honors option for Micro 402; admission by special arrangement.

MICRO 404—FOOD MICROBIOLOGY—3 cr. (2 and 3)
S, '71 and alternate years.

The microbiology of natural and processed foods. The nature of microorganisms involved in food processing, food spoilage, and food poisoning. Methods of isolating, enumerating and identifying these organisms are conducted in the laboratory. *Prerequisite:* Micro 305.

MICRO H404—FOOD MICROBIOLOGY—3 cr. (2 and 3)
S, '71 and alternate years.

Honors option for Micro 404; admission by special arrangement.

MICRO 410—SOIL MICROBIOLOGY—3 cr. (2 and 3)
S, '70 and alternate years.

The role of microorganisms in the decomposition of organic substances; transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. *Prerequisite:* Micro 305.

MICRO H410—SOIL MICROBIOLOGY—3 cr. (2 and 3)
S, '70 and alternate years.

Honors option for Micro 410; admission by special arrangement.

MICRO 411—PATHOGENIC BACTERIOLOGY—3 cr. (2 and 3) S

A study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the diseases caused. *Prerequisite:* Micro 305.

MICRO H411—PATHOGENIC BACTERIOLOGY—3 cr. (2 and 3) S
Honors option for Micro 411; admission by special arrangement.

MICRO 412—BACTERIAL PHYSIOLOGY—4 cr. (3 and 3) S
A consideration of the cytology, physiology, metabolism, and genetics of bacteria. Included will be studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. *Prerequisite:* Micro 305 or Organic chemistry.

MICRO H412—BACTERIAL PHYSIOLOGY—4 cr. (3 and 3) S
Honors option for Micro 412; admission by special arrangement.

MICRO 413—INDUSTRIAL MICROBIOLOGY—3 cr. (2 and 3)
Microbial aspects of large-scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. *Prerequisite:* Micro 305.

MICRO H413—INDUSTRIAL MICROBIOLOGY—3 cr. (2 and 3)
Honors option for Micro 413; admission by special arrangement.

MICRO 414—BASIC IMMUNOLOGY—3 cr. (2 and 3)
A consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigenantibody and other immune reactions. *Prerequisite:* Micro 305 or Organic chemistry.

MICRO H414—BASIC IMMUNOLOGY—3 cr. (2 and 3)
Honors option of Micro 414; admission by special arrangement.

MICRO 415—MICROBIAL GENETICS—4 cr. (3 and 3)
The cytological basis of bacterial genetics; some molecular aspects; mutation and mutagenic agents; population changes; mechanisms of genetic transfers; bacterial viruses as genetic systems; episomes and plasmids. The genetics of certain fungi and of animal and plant viruses will also be considered. *Prerequisite:* Micro 305, Gen 302, Ch 224.

MICRO H415—MICROBIAL GENETICS—4 cr. (3 and 3)
Honors option for Micro 415; admission by special arrangement.

MICRO 416—INTRODUCTORY VIROLOGY—3 cr. (3 and 0)
A general introduction to the field of virology, including animal, bacterial, and plant viruses. Topics will include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay and purification. *Prerequisite:* Micro 305.

MICRO H416—INTRODUCTORY VIROLOGY—3 cr. (3 and 0)
Honors option for Micro 416; admission by special arrangement.

MICRO 491—SPECIAL PROBLEMS IN MICROBIOLOGY—2 cr. (0 and 6)
Research problems in the various areas of Microbiology designed to introduce undergraduate students to the planning and execution of research experimentation, and the presentation of research findings.

MICRO 601—ADVANCED BACTERIOLOGY—4 cr. (2 and 6)

MICRO 602—DAIRY MICROBIOLOGY—3 cr. (2 and 3)

MICRO 604—FOOD MICROBIOLOGY—3 cr. (2 and 3)

Micro 605—General Microbiology—4 cr. (3 and 3)

Micro 610—Soil Microbiology—3 cr. (2 and 3)

Micro 611—Pathogenic Bacteriology—3 cr. (2 and 3)

Micro 612—Bacterial Physiology—4 cr. (3 and 3)

Micro 613—Industrial Microbiology—3 cr. (2 and 3)

Micro 614—Basic Immunology—3 cr. (2 and 3)

Micro 615—Microbial Genetics—4 cr. (3 and 3)

Micro 616—Introductory Virology—3 cr. (3 and 0)

Micro 801—Bacterial Taxonomy—3 cr. (2 and 3)

Micro 802—Bacteriological Technic—4 cr. (2 and 6)

Micro 803—Special Problems in Microbiology—Credit to be arranged.

Micro 807—Seminar—1 cr. (1 and 0)

Micro 810—Soil Microbiology—3 cr. (2 and 3)

Micro 811—Bacterial Cytology and Physiology—4 cr. (4 and 0)

Micro 812—Bacterial Metabolism—3 cr. (3 and 0)

Micro 813—Bacterial Cytology and Physiology Laboratory—2 cr. (0 and 6)

Micro 814—Bacterial Metabolism Laboratory—2 cr. (0 and 6)

Micro 815—Advanced Microbial Genetics—3 cr. (3 and 0)

Micro 891—Research—Credit to be arranged.

MILITARY SCIENCE

Professor: Col. George K. Maertens

Assistant Professors: Maj. O. L. Ellis, Jr., Maj. E. L. Fairbrother, Maj. J. B. Horton, Maj. J. H. Steed, Capt. P. E. Blackwell, Capt. K. W. Boatman, Capt. N. K. Hook, Jr., Capt. S. P. Meyer, Capt. T. L. Murphy, Capt. E. L. Oliver, III

MS 101—Fundamentals (Basic)—1 cr. (2 and 1)

A study of the evolution, organization, and mission of the Reserve Officers' Training Corps, individual weapons and marksmanship and the evolution of weapons and warfare. An introduction to first aid, mass casualty treatment and discussion seminar on current events. Laboratory periods provide training in basic drill, discipline, and leadership.

MS 102—National Defense (Basic)—1 cr. (2 and 1)

A study of the organization of the Department of Defense and its role in national security. An introduction to the history, organization, equipment and mission of the United States Army, with detailed study of small units. A look at the principles and types of war and leadership traits. Current events seminar. Leadership laboratory.

MS 201—INTRODUCTION TO OPERATIONS AND BASIC TACTICS AND MAP AND AERIAL PHOTOGRAPH READING (BASIC)—1 cr. (2 and 1)

An introduction to the organization, principles, and fundamentals of small unit tactics, emphasizing the importance of fire and maneuver. Interpretation and use of maps and aerial photographs in study and evaluation of terrain.

MS 202—AMERICAN MILITARY HISTORY (BASIC)—1 cr. (2 and 1)

A survey of American military history from the origins of the American Army to the present, with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social and similar patterns found in our present-day Army.

MS 300—MILITARY SCIENCE (ADVANCED)—6 cr. (ROTC 3, Elective 3)

Study and practical application of Leadership; Military Teaching Principles; Branches of the Army; Small Unit Tactics and Communications. Further training for duty as officers by application of principles of leadership in actual command during drills, parades, reviews, inspections, and ceremonies. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective course or Advanced ROTC during either semester but must participate in Leadership Laboratory Training throughout the school year.

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester, and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

MS 400—MILITARY SCIENCE (ADVANCED)—6 cr. (ROTC 3, Elective 3)

A study of Military Operations; Logistics; Administrative Management; Military Law; Service Orientation; World Change and Military Implications; Internal Defense/Development; and Leadership Laboratory. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective or Advanced ROTC during either semester but must participate in Leadership Laboratory Training throughout the school year.

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester, and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

MUSIC

Associate Professor: J. H. BUTLER, *Head*

Assistant Professors: B. F. COOK,* E. A. FREEMAN

Instructors: EDITH B. CARD, J. K. COPENHAVER, J. E. JACKSON, E. W. WINSTON

MUS 151—APPLIED MUSIC—1 cr. (1 and 0)

Individual study in performance medium (voice, piano, flute, oboe, clarinet, saxophone, bassoon, cornet, trumpet, French horn, trombone, baritone, tuba, percussion). One hour-long private lesson each week, for which a minimum of four hours' practice is required. The student is guided in a continuing advance of his technical and artistic proficiency, and is required to perform an appropriate solo in a student recital each semester. May be repeated for credit with departmental approval to allow for the study of differing performance media. *Prerequisite:* Consent of instructor, based on a qualifying audition.

MUS 152—APPLIED MUSIC—1 cr. (1 and 0)

A continuation of Mus 151. *Prerequisite:* Mus 151.

MUS 205—MUSIC THEORY—3 cr. (3 and 0)

The terminology and notation of traditional music are reviewed, and the techniques of sight-singing and sight-reading are practiced. Harmonic practices are studied, relating to the principal diatonic triads in all inversions. *Prerequisite:* Consent of instructor, based on musical literacy.

MUS 206—MUSIC THEORY—3 cr. (3 and 0)

Continuation of Mus 205 with emphasis on secondary chord structure, modulation, and non-diatonic harmony. Advanced sight-singing and melodic dictation are practiced. *Prerequisite:* Mus 205.

MUS 210—MUSIC APPRECIATION: MUSIC IN THE WESTERN WORLD—3 cr. (3 and 0)

Designed to deepen the student's appreciation of his musical heritage through a study of the elements of the musical language and its development in western culture.

MUS 251—APPLIED MUSIC—1 cr. (1 and 0)

A continuation of Mus 152. *Prerequisite:* Mus 152 and consent of instructor.

MUS 252—APPLIED MUSIC—1 cr. (1 and 0)

A continuation of Mus 251. *Prerequisite:* Mus 251.

MUS 305—MUSIC THEORY: ADVANCED HARMONY—3 cr. (3 and 0)

A study of harmonic usage involving chromaticism, free dissonance and atonality. Harmonic dictation is practiced. *Prerequisite:* Mus 206.

MUS 306—MUSIC THEORY: FORM AND ANALYSIS—3 cr. (3 and 0)

Principles of formal construction in music of all periods are studied by the inductive analysis of representative works. *Prerequisite:* Mus 206.

MUS 311—MUSIC APPRECIATION: AMERICAN MUSIC—3 cr. (3 and 0)

Music in America from 1620 to the present. Indigenous and borrowed influences will be examined.

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* On leave.

Mus 315—Music History—3 cr. (3 and 0)

The development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods.

Mus 316—Music History—3 cr. (3 and 0)

Continuation of Mus 315. Music from 1750 to present. *Prerequisite:* Mus 315.

Mus 361—Marching Band—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Fall semester only. *Prerequisite:* Consent of director.

Mus 362—Concert Band—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Spring semester only. *Prerequisite:* Consent of director.

Mus 365—University Chorus—1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Prerequisite:* Consent of director.

Mus 400—Music in the Elementary School Classroom—3 cr. (3 and 0)

Designed to give the teacher in the elementary school a familiarity with music suitable for use with children at the elementary level. Recordings of appropriate music, preband instruments, unison and part singing will be included. No previous training in music is required.

Mus 401—Methods and Materials in Elementary School Music—3 cr. (3 and 0)

Materials, methods, and techniques in elementary school. *Prerequisite:* Mus 400.

Mus 421—Vocal Arranging—3 cr. (3 and 0)

Techniques of arranging for voices and accompanying instruments are studied and appropriate arrangements prepared. *Prerequisite:* Mus 305.

Mus 422—Instrumental Arranging—3 cr. (3 and 0)

Transpositions, characteristics and range of the instruments of the band and orchestra are studied. Techniques of arranging for small instrumental ensembles are studied and appropriate arrangements prepared. *Prerequisite:* Mus 305.

Mus 423—Conducting—3 cr. (3 and 0)

Basic principles and techniques of conducting, interpretation and score reading are studied and applied with vocal or instrumental ensembles. *Prerequisite:* Mus 306 and 4 hours of ensemble credit.

NURSING

(ASSOCIATE IN ARTS DEGREE PROGRAM)

Associate Professor: LEON ROSWAL, *Director*

Assistant Professors: AILEEN S. PREVOST, HARRIETT E. WHITLEY

Instructors: JULIA HILL HIGGINS, MARY ANN KELLY, SARA STOKES, MARY ANN TEKLITS

NURS 100—ORIENTATION—1 cr. (1 and 0)

Series of lectures and discussions on nursing and careers in nursing; personal and professional guidance.

NURS 101—FUNDAMENTALS OF NURSING I—6 cr. (3 and 9)

This introductory course is oriented to the normal health needs of all people, sick and well. Study of the concepts and scientific principles of the bio-socio-psychological sciences that are applicable in the nursing practices common to all patients. College and hospital laboratory learning experiences provide an opportunity to adapt these principles and develop beginning skill in selected technical and interpersonal aspects of nursing.

NURS 102—FUNDAMENTALS OF NURSING II—6 cr. (3 and 9)

In this course, sequential to Nurs 101, the skills, knowledge and principles are further developed. A patient-centered orientation to basic-nursing practices is continued in assisting the individual to attain and/or maintain homeostasis. Dietary, pharmacological, fluid and electrolyte balance and mental concepts are integrated and correlated. *Prerequisite:* Nurs 101 with grade of C or better.

NURS 105—INTEGRATED SCIENCE I—4 cr. (3 and 2)

A general course surveying chemistry, human anatomy, physiology, and microbiology, and emphasizing the physical and chemical bases for physiology.

NURS 106—INTEGRATED SCIENCE II—4 cr. (3 and 2)

Continuation of Nurs 105.

NURS 200—MATERNAL AND CHILD HEALTH NURSING—5 cr. (3 and 6)

This course is built around the family unit and the role of the nurse and others in providing for the child-bearing health needs of families. The normal aspects and common health problems which occur during the maternity cycle are stressed. Includes concurrent guided learning experiences in the hospital and other health agencies. *Prerequisite:* Nurs 102 with a grade of C or better and satisfactory completion of Nurs 106. Concurrent enrollment or completion in Nurs 201, Psych 211, Soc 201.

NURS 201—MAJOR HEALTH PROBLEMS I—5 cr. (3 and 6)

This course is the first of the three interrelated sequential courses designed to develop a knowledge of principles which can be applied when planning and giving care to various age groups with major health problems (acute and long term patients). *Prerequisite:* Nurs 102 with a grade of C or better and satisfactory completion of Nurs 106. Concurrent enrollment or completion in Nurs 200, Psych 211, Soc 201.

NURS 202—MAJOR HEALTH PROBLEMS II—5 cr. (3 and 6)

Continuation of major health problems encountered by individuals throughout life cycle, with emphasis on prevention, treatment, promotion of health and rehabilitation. Guided learning experiences in nursing care are concurrently provided in the hospital and other agencies. *Prerequisite:* Nurs 200, 201, with a grade of C or better.

NURS 203—MAJOR HEALTH PROBLEMS III—5 cr. (3 and 6)

A continuation of Nurs 201 and concomitant with Nurs 202. It is directed toward the nursing care of the patient with intensive and long-term-illness as mobility disorders and mental illness. Further planned experiences designed to develop skill and knowledge in the selected nursing care of patients with a complexity of problems. *Prerequisite:* Nurs 200, 201, with a grade of C or better.

NURS 204—NURSING SEMINAR—1 cr. (1 and 0)

A course planned to consider contemporary social, legal and ethical forces that affect the nurse, the field of nursing and society. Discussion will focus on socio-economic aspects, legislative and health care issues. *Prerequisite:* Nurs 200, 201, with a grade of C or better.

NURSING

(BACCALAUREATE DEGREE PROGRAM)

Professor: GERALDINE LABECKI, *Director*

Associate Professors: ARLINE M. DUVALL, ROSE A. GODBOUT, ELIZABETH J. HALL

Assistant Professors: MELBA CATHER, REGINA THOMPSON

Instructors: CLAUDIA M. BLANFORD, OPAL S. HIPPS, CAROLYN J. KELLEY, CYNTHIA A. LEAHY, SUSAN ROCKWELL

Lecturers: MARILYN B. CHASSIE, D. K. FREEMAN, ANN R. LUKAWECKI

NURS 100—ORIENTATION—1 cr. (1 and 0)

NURS 207—DYNAMICS OF HUMAN RELATIONS—3 cr. (2 and 3)

The nursing appraisal of theoretical and clinical approaches to the understanding of the dynamics of human behavior. The identification of behaviors through observing and participating in laboratory experiences in community agencies providing service to adults and children. Incorporates the beginning of a longitudinal study of a selected family.

NURS 208—PROBLEM SOLVING IN NURSING—3 cr. (2 and 3)

Introduction to the concept of problem solving in nursing throughout health-illness cycle. Selected models are presented and analyzed. Relevant technical skills identified in the analysis are learned. Emphasis on creative approach to solving nursing problems and the utility of the technic to the solution. Laboratory experience in the classroom and with hospitalized patients.

NURS 309—HUMAN VALUES IN NURSING—3 cr. (3 and 0)

The values guiding nursing theory and practice, including common human needs; the nature of man and his community.

NURS 310—PERSPECTIVES IN NURSING INTERVENTION—3 cr. (3 and 0)

Analysis of processes used in making nursing judgments. Emphasis on planning, intervention, and evaluation.

NURS 311—NURSING DURING ALTERATIONS IN LIFE PATTERNS—4 cr. (1 and 9)

Study of the ways in which people perceive and cope with changes in their life patterns; emphasis on the synthesis of knowledge from the arts and sciences as a basis for deliberative nursing action. Laboratory experience in a variety of settings with all age groups.

NURS 312—NURSING OF THE ACUTELY AND CHRONICALLY DISTRESSED—4 cr. (1 and 9)

Nursing concepts based on a broad patho-psychophysiologic approach toward understanding changes in functions as a result of stress and/or disease. Laboratory experience in agencies providing care for the mentally and physically distressed.

NURS 313—THE PROMOTION OF HEALTH—3 cr. (2 and 3)

Role of the nurse in the teaching of health in the home and in agencies concerned with the prevention of illness. Emphasis on nutrition as a positive approach to the improvement of health throughout the life cycle. Laboratory experience in clinics, homes, and selected community programs.

NURS 314—NURSING IN THE HOME—3 cr. (2 and 3)

The dimensions of caring for the ill in the home; includes early detection, treatment, and the use of resources with emphasis on continuity of care. Laboratory experience with agencies providing home care.

NURS 415—NURSING AS A SOCIAL FORCE—3 cr. (3 and 0)

Role of professional nursing in comprehensive health planning related to changing social forces.

NURS 417—INTENSIVE NURSING—4 cr. (1 and 9)

Nursing in highly stressful situations. Assisting individuals and families in coping with life-threatening experiences. Laboratory experience in the home and acute care facilities.

NURS 419—THE MULTIPROBLEM FAMILY—3 cr. (2 and 3)

Focus on the family as a unit of care. Use of the epidemiologic approach as a tool in understanding conditions influencing the family. Laboratory experience through community care facilities.

NURS 421—HISTORY AND PHILOSOPHY OF NURSING—3 cr. (3 and 0)

Analysis of the development of modern nursing. Emphasis will be placed on how the nursing profession articulates with society and the role of nurses as change agents. Consideration will be given to the legal and ethical implications in nursing practice.

NURS 422—CURRENT RESEARCH IN NURSING—3 cr. (3 and 0)

A study of approaches to problematic situations in nursing, with emphasis on interpretation of findings.

NURS 425—INDEPENDENT STUDY IN NURSING—7 cr. (3 and 12)

Opportunity for in-depth study in an area of special interest in clinical nursing. Laboratory experience arranged.

NUTRITION

Professors: B. D. Barnett, W. A. King, R. F. Wheeler, W. P. Williams, Jr.

Associate Professors: R. F. Borgman, R. L. Edwards, D. M. Henricks, J. E. Jones, G. D. O'Dell, D. E. Turk

Assistant Professors: J. J. Jen, J. C. McConnell

(See courses listed under Animal Science, Biochemistry, Dairy Science, Food Science, and Poultry Science)

Nutr 201—Introduction to Nutrition—3 cr. (3 and 0) S
Principles of the nutrition of domestic animals and man includes: sources, digestion, absorption, utilization and functions of nutrients; effects of dietary deficiencies; and nutrients required for maintenance, growth, reproduction, lactation, work, and egg-shell quality.

Nutr 401—Fundamentals of Nutrition—3 cr. (3 and 0) F
Biochemical and physiological fundamentals of nutrition applicable to domestic animals and man. Considered are digestive processes, and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals and vitamins. Energy metabolism and comparative anatomy and physiology of digestive systems are discussed.

Nutr 451—Human Nutrition—3 cr. (3 and 0)
Essentials of nutrition and principle nutritional deficiency conditions. Factors affecting adequacy of dietary intake, methods of determining nutritional status, the development of nutrition standards, and recent advances in human nutrition.

Nutr 601—Fundamentals of Nutrition—3 cr. (3 and 0)

Nutr 651—Human Nutrition—3 cr (3 and 0)

Nutr 801—Topical Problems in Nutrition—1-3 cr.

Nutr 808—Monogastric Nutrition—3 cr. (3 and 0)

Nutr 809—Polygastric Nutrition—3 cr. (3 and 0)

Nutr 812—Metabolism of Nutrients—3 cr. (3 and 0)

Nutr 813—Nutrition Techniques with Large Animals—2 cr. (1 and 3)

Nutr 814—Nutrition Techniques with Laboratory Animals—2 cr. (1 and 3)

Nutr 816—Amino Acids and Protein Nutrition—2 cr. (2 and 0)

Nutr 818—Vitamins and Minerals—4 cr. (3 and 3)

Nutr 851—Nutrition Seminar I—1 cr. (1 and 0)

Nutr 852—Nutrition Seminar II—1 cr. (1 and 0)

Nutr 891—Research—Credit to be arranged.

Nutr 991—Doctoral Research—Credit to be arranged.

PHILOSOPHY

Assistant Professors: J. L. McCollough, D. F. White, Jr.
Instructor: W. M. Pharr, Jr.

Phil 201—Introduction to Philosophy—3 cr. (3 and 0)
An introduction to the basic issues involved in philosophical thinking, with special emphasis upon these issues as they occur in Greek philosophy. The systems of Plato and Aristotle will be considered in some detail.

Phil 211—Philosophy and Current Issues—3 cr. (3 and 0)
An exercise in developing the beginner's philosophic skills and his ability to think critically and reflectively about the problems he encounters. Selections from contemporary writing will be compared with philosophic classics in order to analyze familiar moral and social problems of current importance as well as the intellectual issues underlying many prevailing conflicts of opinion.

Phil 302—Logic—3 cr. (3 and 0)
Introduction to the theory and practice of evaluating arguments; reduction of ordinary language to logical form and the relation of statement and inference; use of the rules of natural deduction and proof of their consistency and completeness for the logic of propositions (truth-functions) and the logic of predicates (quantification).

Phil 303—Philosophy of Religion—3 cr. (3 and 0)
An analytical and critical consideration of the philosophical foundations of religion. Such topics as the existence of God, the problem of evil, theism and atheism, prayer, and immortality will be considered.

Phil 304—Introduction to Ethical Theory—3 cr. (3 and 0)
An examination of moral judgment; its concepts, criteria and relations to factual judgment. Classical theories and current issues are searched for an ideal of the good man and the life we prize. Construction of a model theory of obligation, value, justice, and punishment is attempted.

Phil 305—Aesthetics—3 cr. (3 and 0)
A study of the function of art in human life along with a consideration of the various philosophical elements involved in art and art criticism. Various historical types of aesthetic theory will be considered. *Prerequisite:* Junior standing or permission of instructor.

Phil 309—Religions of the Far East—3 cr. (3 and 0)
A study of the origin, evolution, and contemporary status of Hinduism, Buddhism, Confucianism, and Taoism. *Prerequisite:* Junior standing.

Phil 312—Modern Philosophy—3 cr. (3 and 0)
The development of the modern mind as seen in the Renaissance and eighteenth century philosophers. The writings of Hobbes, Locke, Spinoza, Leibnitz, Hume, and Kant will be considered along with the development of rationalism and empiricism.

Phil 318—Contemporary Philosophy—3 cr. (3 and 0)
A study of some of the recent schools and movements in philosophy. Pragmatism, existentialism, vitalism, recent realism, and some of the linguistic schools will be considered.

Phil 322—Symbolic Logic—3 cr. (3 and 0)

A consideration of the necessary logical structure of a very exact language in terms of modern relational logic. Quantification, Truth Functions, Propositional Functions, Properties of Relations, Arguments Involving Relations, and some nonformal logical systems will be considered. *Prerequisite:* Phil 302, or Math 108, or a computer programming course.

Phil 344—Current Ethical Theory—3 cr. (3 and 0)

An examination of present trends in ethical and meta-ethical theory for their bearing upon the criteria of our judgments of human conduct and character and upon current moral issues. Selected topics from the logic, epistemology, and psychology of ethical judgment will be considered, with review of relevant journal literature. *Prerequisite:* Phil 304 or permission of instructor.

Phil 422—Mathematical Logic—3 cr. (3 and 0)

A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Phil 322 or sufficient mathematical background.

Phil 425—Philosophy of Science—3 cr. (3 and 0)

A study of the presuppositions, categories, and implications of the physical and social sciences with special reference to the concepts of Space and Time, Matter, Causation, and Relativity. The logic of "scientific method" and the unity of the sciences are considered. *Prerequisite:* Junior standing and permission of instructor.

Phil 825—Seminar in Philosophy of Science—3 cr. (3 and 0)

PHYSICAL SCIENCE

(Jointly administered by the Chemistry and Physics Departments)

Phy Sc 101—Physical Science I—4 cr. (3 and 2)

An introduction to the physical sciences. Selected topics will be discussed to illustrate the structure and meaning of the physical sciences. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

Phy Sc H101—Physical Science I—4 cr. (3 and 2)

Honors section of Phy Sc 101. Open by invitation only.

Phy Sc 102—Physical Science II—4 cr. (3 and 2)

A continuation of Phy Sc 101. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

PHYSICS

Professors: H. W. Graben, M. J. Skove, E. P. Stillwell, *Head;* H. E. Vogel

Associate Professors: B. B. Bookmyer, B. V. Bronk, P. B. Burt, R. L. Chaplin, Jr., W. E. Gettys, J. L. Ging, F. J. Keller, A. L. Laskar, D. P. Miller, M. G. Miller, J. R. Ray, M. D. Sherrill, K. L. Wood

Assistant Professors: T. F. Collins, J. A. Gilreath, J. R. Manson, P. A. Steiner, R. C. Turner, C. W. Ulbrich

Phys 101—Current Topics in Modern Physics—1 cr. (0 and 2)

Demonstrations and lectures supplemented by slides and motion pictures on current topics in physics, such as superfluids, lasers, superconductors, elementary particles, etc., chosen from the fields of atomic, nuclear, solid state physics, and astrophysics. Several members of the staff will participate.

Phys 115—Classical Physics I—3 cr. (3 and 0)

A survey of classical physics in which emphasis is placed on those principles which are of greatest utility in modern applications. Some of the history and philosophy of physics is included. Topics discussed include mechanics, astronomy, fluid mechanics applied to the properties of air and water, and wave motion with emphasis on sound waves. *Corequisite:* A course that includes calculus or permission of instructor.

Phys 116—Classical Physics II—3 cr. (3 and 0)

A continuation of Phys 115. Topics covered include thermodynamics with emphases on the properties of air and water, electricity and magnetism with a brief introduction to electronics, optics, and an introduction to materials science. *Prerequisite:* Phys 115.

Phys 122—Mechanics and Wave Phenomena—3 cr. (3 and 0)

Vectors; laws of motion; rotation; vibratory and wave motion; mechanical properties of materials. *Prerequisite:* Registration in Math 108.

Phys H122—Mechanics and Wave Phenomena—3 cr. (3 and 0)

Honors section of Phys 122. Open by invitation only.

Phys 132—General Physics for Physics Majors I—3 cr. (3 and 0)

Introduction to physical quantities, linear and rotational motion, conservation laws, gravitational and electric fields, and kinetic theory. *Prerequisite:* Registration in Math 108.

Phys 207—General Physics—4 cr. (3 and 2)

An introductory course for students who are not majoring in a pure science or engineering. Includes mechanics, light, and astronomy. *Corequisite:* A course that includes trigonometry.

Phys 208—General Physics—4 cr. (3 and 2)

Continuation of Phys 207. Includes electricity, magnetism, thermal phenomena, and quantum theory. *Prerequisite:* Phys 207.

Phys 221—Thermal and Electrical Phenomena—3 cr. (3 and 0)

Thermal properties of matter; electric and magnetic fields; electric currents and circuits; motions of charged particles in fields. *Prerequisite:* Phys 122.

Phys H221—Thermal and Electrical Phenomena—3 cr. (3 and 0)

Honors section in Phys 221. Open by invitation only.

PHYS 222—OPTICS AND MODERN PHYSICS—3 cr. (3 and 0)
Theory of light waves and photons; optical instruments; relativity; atomic particles; nuclear physics. *Prerequisite:* Phys 221.

PHYS H222—OPTICS AND MODERN PHYSICS—3 cr. (3 and 0)
Honors section in Phys 222. Open by invitation only.

PHYS 223—ELECTRON PHYSICS LABORATORY—1 cr. (0 and 3)
An introduction to physical experimentation employing the Berkeley A laboratory course. Experiments are performed in acceleration and deflection of electrons, measurement of electron charge to mass ratio by helical motion and time of flight, oscillating systems involving capacitance, resistance and inductance, resonance, modulation, negative resistance and relaxation oscillations. *Prerequisite:* Registration in Phys 221 or 231.

PHYS 224—MODERN PHYSICS LABORATORY—1 cr. (0 and 3)
Continuation of Phys 223. Experiments in the areas of solid state, optical and modern physics. Experiments are performed on electrical carrier mobility in solids, minority carrier lifetime, transistor action, microwave optics, interference and diffraction, light polarizaton, gas laser optics, optical spectra, electron and X-ray diffraction, radioactive particle counting. Compton scattering of X-rays, radioactivity decay and Mossbauer effect. *Prerequisite:* Registration in Phys 222 or 232.

PHYS 231—GENERAL PHYSICS FOR PHYSICS MAJORS II—3 cr. (3 and 0)
A continuation of Phys 132. An introduction to the magnetic field, electric circuits, wave motion, reflection, refraction, diffraction of waves, electromagnetic waves. *Prerequisite:* Phys 132; registration in Phys 223.

PHYS 232—GENERAL PHYSICS FOR PHYSICS MAJORS III—3 cr. (3 and 0)
A continuation of Phys 231. An introduction to thermodynamics, relativity, particle and wave descriptions of matter and light. Includes a description of experiments which were crucial to recent developments in physics. *Prerequisite:* Phys 231; registration in Phys 224.

PHYS 240—PHYSICS OF THE ATMOSPHERIC ENVIRONMENT—3 cr. (3 and 0)
An introduction to meteorological processes with emphasis placed on qualitative descriptions. Includes thermodynamics of the atmosphere, solar radiation and the heat budget, circulation of the atmosphere, force laws governing air mass motions, fronts, condensation processes, synoptic prediction. Special topics would consider the effects of environmental pollution on weather and the effects of weather on health.

PHYS 321—MECHANICS I—3 cr. (3 and 0)
Statics; motions of particles and rigid bodies; vibratory motion; gravitation; properties of matter, flow of fluids. *Prerequisite:* Phys 221 or 231.

PHYS 322—MECHANICS II—3 cr. (3 and 0)
Dynamics of particles and of rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. *Prerequisite:* Phys 321 or permission of instructor.

PHYS 325—EXPERIMENTAL PHYSICS I—4 cr. (2 and 6)
Introduction to laboratory techniques, measurement of fundamental constants, and performance of some of the experiments (Stern-Gerlach, Zeeman, Photo-

electric, specific charge of electrons and protons, etc.) which are crucial to the development of our present concepts of physics. *Prerequisite:* Phys 321 or equivalent, or enrollment in Phys 321, or by permission of instructor.

PHYS 326—EXPERIMENTAL PHYSICS II—4 cr. (2 and 6)
Continuation of Phys 325.

PHYS 340—ELECTRICITY AND MAGNETISM I—3 cr. (3 and 0)
Electric potential and electrostatic fields; solutions of Laplace's and Poisson's equations; properties of dielectrics and of capacitors; electrostatic energy; current and treatment of circuit problems. Vector analysis is used throughout after introduction. *Prerequisite:* Phys 221 or 231.

PHYS 401—SENIOR THESIS I—3 cr. (1 and 6)
The senior thesis is a semi-original piece of work performed under the direction of a member of the physics staff. Theoretical fields available include relativity, statistical mechanics, nuclear physics and astrophysics. Experimental work may be done in the fields of X-ray diffraction elasticity, low-temperature thermal conductivity, super-conductivity, radiation damage in metals, and electron paramagnetic resonance. *Prerequisite:* At least three physics courses beyond general physics.

PHYS 402—SENIOR THESIS II—3 cr. (1 and 6)
A continuation of Phys 401.

PHYS 406—INTRODUCTION TO BIOPHYSICS—3 cr. (3 and 0)
An introduction to the application of the ideas and methods of physics to biological problems. Topics will be selected from such areas as: size and structure of biological macro-molecules, enzyme kinetics, population kinetics, effects of ionizing radiation, nerve excitation, membrane transport, and applications of statistical physics to biological systems. *Prerequisite:* Phys 221, Math 206, or permission of instructor.

PHYS 432—PHYSICAL OPTICS AND INTODUCTION TO SPECTROSCOPY—3 cr. (3 and 0)
Theory and application of interference and diffraction phenomena, polarized light, magneto-optics and electro-optics. Introductory theory of spectroscopy. *Prerequisite:* Phys 222 or 232.

PHYS 441—ELECTRICITY AND MAGNETISM II—3 cr. (3 and 0)
A continuation of Phys 340. Magnetic fields and energy; magnetic properties of materials; electromagnetic induction; A. C. circuit problems with vector methods and complex numbers; Maxwell's field equations with applications. *Prerequisite:* Phys 340 or equivalent.

PHYS 446—SOLID STATE PHYSICS—3 cr. (3 and 0)
An introductory treatment of the crystal structure of solids and the properties of solids which depend on crystal structure; free electron model of metals; band theory of solids; Brillouin zones, crystalline defects and diffusion. *Prerequisite:* Phys 222, or 232, or permission of instructor.

PHYS 452—INTRODUCTORY NUCLEAR PHYSICS—3 cr. (3 and 0)
Various phases of nuclear physics including natural and induced radioactivity; properties of alpha, beta and gamma-rays; cosmic rays; nuclear energy

levels and decay schemes; particle accelerators, fission, fusion and nuclear reactors. *Prerequisite:* Phys 222 or 232.

PHYS 454—NUCLEAR PHYSICS LABORATORY—1 cr. (0 and 3)
Techniques and instruments used in detection and measurement of nuclear radiation. Experiments include half-life determination, absorption measurements, neutron activation, coincidence measurements, decay schemes, and gamma ray spectroscopy. *Prerequisite:* Registration in Phys 452.

PHYS 455—QUANTUM PHYSICS I—3 cr. (3 and 0)
Discussion of solution of the Schroedinger equation for free particles, the hydrogen atom and the harmonic oscillator. *Prerequisite:* Phys 322, 340, or permission of instructor.

PHYS 456—QUANTUM PHYSICS II—3 cr. (3 and 0)
Continuation of Phys 455. Application of principles of quantum mechanics as developed in Phys 455 to atomic, molecular, solid state and nuclear systems. *Prerequisite:* Phys 455.

PHYS 460—MODERN PHYSICS FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)
A study of later developments including the measurements of atomic particles. The formulation of new laws and the modifications of old ideas needed to describe the interactions of these particles.

PHYS 465—THERMODYNAMICS AND STATISTICAL MECHANICS—3 cr. (3 and 0)
A study of temperature, development of the laws of thermodynamics and their application to thermodynamic systems. An introduction to low temperature physics is given. *Prerequisite:* Six hours of physics beyond Phys 222 or permission.

PHYS 471—ELECTRON MICROSCOPY—3 cr. (2 and 3)
The theory and operation of the electron microscope. Magnetic lens theory. The technique of specimen mounting and the interpretation of electron micrographs and diffraction patterns. Each student may choose specimens from his major field. *Prerequisite:* General physics, Math 206, and permission of instructor.

PHYS 473—X-RAY CRYSTALLOGRAPHY—3 cr. (2 and 3)
A study of crystal symmetry, elementary space group theory, diffraction of X-rays by electronic charge distribution. Experimental methods of optical goniometry, powder diffraction and single crystal techniques are used to obtain diffraction intensities from a simple crystalline solid and electron charge distribution is determined. Applications of X-ray diffraction to chemical, physical and metallurgical investigations are discussed.

PHYS 621—MECHANICS I—3 cr. (3 and 0)

PHYS 622—MECHANICS II—3 cr. (3 and 0)

PHYS 625—EXPERIMENTAL PHYSICS I—4 cr. (2 and 6)

PHYS 626—EXPERIMENTAL PHYSICS II—4 cr. (2 and 6)

PHYS 632—PHYSICAL OPTICS AND INTRODUCTION TO SPECTROSCOPY—3 cr. (3 and 0)

PHYS 640—ELECTRICITY AND MAGNETISM I—3 cr. (3 and 0)

PHYS 641—ELECTRICITY AND MAGNETISM II—3 cr. (3 and 0)

PHYS 646—SOLID STATE PHYSICS—3 cr. (3 and 0)

PHYS 652—INTRODUCTORY NUCLEAR PHYSICS—3 cr. (3 and 0)

PHYS 655—QUANTUM PHYSICS I—3 cr. (3 and 0)

PHYS 656—QUANTUM PHYSICS II—3 cr. (3 and 0)

PHYS 660—MODERN PHYSICS FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 665—THERMODYNAMICS AND STATISTICAL MECHANICS—3 cr. (3 and 0)

PHYS 671—ELECTRON MICROSCOPY—3 cr. (2 and 3)

PHYS 673—X-RAY CRYSTALLOGRAPHY—3 cr. (2 and 3)

PHYS 701—PHYSICS FOR HIGH SCHOOL TEACHERS I—4 cr. (3 and 3)

PHYS 702—PHYSICS FOR HIGH SCHOOL TEACHERS II—4 cr. (3 and 3)

PHYS 703—MODERN PHYSICS FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 704—ASTRONOMY FOR HIGH SCHOOL TEACHERS—3 cr. (3 and 0)

PHYS 811—METHODS OF THEORETICAL PHYSICS I—3 cr. (3 and 0)

PHYS 812—METHODS OF THEORETICAL PHYSICS II—3 cr. (3 and 0)

PHYS 813—ADVANCED THERMODYNAMICS AND STATISTICAL MECHANICS I—3 cr. (3 and 0)

PHYS 814—ADVANCED THERMODYNAMICS AND STATISTICAL MECHANICS II—3 cr. (3 and 0)

PHYS 821—CLASSICAL MECHANICS I—3 cr. (3 and 0)

PHYS 822—CLASSICAL MECHANICS II—3 cr. (3 and 0)

PHYS 841—ELECTRODYNAMICS I—3 cr. (3 and 0)

PHYS 842—ELECTRODYNAMICS II—3 cr. (3 and 0)

PHYS 845—SOLID STATE I—3 cr. (3 and 0)

PHYS 846—SOLID STATE II—3 cr. (3 and 0)

PHYS 853—NUCLEAR PHYSICS I—3 cr. (3 and 0)

PHYS 854—NUCLEAR PHYSICS II—3 cr. (3 and 0)

PHYS 856—CRYSTALLOGRAPHY—3 cr. (3 and 0)

PHYS 875—SEMINAR IN CONTEMPORARY PHYSICS—1-3 cr. (1-3 and 0)

PHYS 891—RESEARCH—Credit to be arranged.

PHYS 922—HYDRODYNAMICS—3 cr. (3 and 0)

PHYS 951—QUANTUM MECHANICS I—3 cr. (3 and 0)

PHYS 952—QUANTUM MECHANICS II—3 cr. (3 and 0)

PHYS 955—ADVANCED MODERN PHYSICS I—3 cr. (3 and 0)

PHYS 956—ADVANCED MODERN PHYSICS II—3 cr. (3 and 0)

PHYS 966—RELATIVITY—3 cr. (3 and 0)

PHYS 991—DOCTORAL RESEARCH—Credit to be arranged.

PLANT PATHOLOGY

Professors: L. W. Baxter, W. M. Epps, *Head;* J. E. Halpin, W. Witcher
Associate Professor: G. C. Kingsland
Assistant Professors: O. W. Barnett, E. I. Zehr
Lecturer: W. M. Dowler

Pl Pa 401—Plant Pathology—3 cr. (2 and 3) F, S
The principles of the interrelationships between plant pathogens, their hosts, and the environment. Economically important plant diseases are used to illustrate these principles and the application of these principles to disease control. *Prerequisite:* Bot 102.

Pl Pa H401—Plant Pathology—3 cr. (2 and 3) F, S
Honors option for Pl Pa 401; admission by special arrangement.

Pl Pa 405—Forest Pathology—3 cr. (2 and 3) F
Principles of plant pathology as related to forest tree diseases; casual agents and their effects on the suscept; prevention and control and minimizing losses; relation of disease control to silviculture, management, and forest products utilization. *Prerequisite:* Bot 102, 352, or permission of instructor.

Pl Pa H405—Forestry Pathology—3 cr. (2 and 3) F
Honors option for Pl Pa 405; admission by special arrangement.

Pl Pa 451—Bacterial Plant Pathogens—3 cr. (2 and 3) S, '73 and alternate years.
The nature, development, and control of plant diseases caused by bacteria. Taxonomic considerations, host-parasite relations and techniques used in isolating, identifying, and preserving bacterial plant pathogens. *Prerequisite:* Pl Pa 401, or 405, Micro 305, or permission of instructor.

Pl Pa 456—Plant Virology—3 cr. (3 and 0), S, '74 and alternate years.
Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector relationships; and serological procedures. The importance and control of plant virus diseases will be discussed. *Prerequisite:* Bot 102.

Pl Pa H456—Plant Virology—3 cr. (3 and 0), S, '74 and alternate years.
Honors option for Pl Pa 456; admission by special arrangement.

Pl Pa 458—Plant Parasitic Nematodes—3 cr. (2 and 3) F, '72 and alternate years.
Morphology and taxonomy of stylet bearing nematodes and their relationship with plant diseases *Prerequisite:* Bot 102, Zool 102.

Pl Pa H458—Plant Parasitic Nematodes—3 cr. (2 and 3) F, '72 and alternate years.
Honors option for Pl Pa 458; admission by special arrangement.

Pl Pa 601—Plant Pathology—3 cr. (2 and 3)

Pl Pa 605—Forest Pathology—3 cr. (2 and 3)

Pl Pa 651—Bacterial Plant Pathogens—3 cr. (2 and 3)

Pl Pa 656—Plant Virology—3 cr. (3 and 0)

Pl Pa 658—Plant Parasitic Nematodes—3 cr. (2 and 3)

Pl Pa 800—Advanced Plant Pathology I—3 cr. (3 and 0)

Pl Pa 801—Advanced Plant Pathology II—3 cr. (3 and 0)

Pl Pa 804—Physiological Plant Pathology—3 cr. (3 and 0)

Pl Pa 805—Special Problems in Plant Pathology—Credit to be arranged.

Pl Pa 807—Seminar—1 cr. (1 and 0)

Pl Pa 808—Techniques and Methods in Plant Pathology I—1 cr. (0 and 3)

Pl Pa 809—Techniques and Methods in Plant Pathology II—1 cr. (0 and 3)

Pl Pa 811—Plant Disease Diagnosis I—1 cr. (0 and 3)

Pl Pa 812—Plant Disease Diagnosis II—1 cr. (0 and 3)

Pl Pa 891—Research—Credit to be arranged.

Pl Pa 991—Doctoral Research—Credit to be arranged.

POLITICAL SCIENCE

Associate Professors: W. H. Owens, Jr., J. E. Tuttle

Assistant Professors: H. E. Albert, E. M. Coulter, R. A. Rimkus, M. W. Slann

Instructor: H. W. Fleming

Pol Sc 101—Introduction to Political Science I, American Government—3 cr. (3 and 0)

A general introduction to public administration, political behavior, and public law, with a concentrated treatment of American institutions. (Formerly Pol Sc 202.)

Pol Sc 201—Introduction to Political Science II—3 cr. (3 and 0)

A basic introduction to the study, analysis, scope, and sources of government. Emphasis is given to the comparative institutions of government, the international relations of government, the theoretical conceptions man has entertained about government, and analysis of the ways in which man has behaved in response to government. *Prerequisite:* Pol Sc 101 or 301, or permission of instructor.

Pol Sc 301—American Government and Political Parties—3 cr. (3 and 0)

The Constitution: powers and functions of the governmental activities; political parties and elections. Not open to those who have completed Pol Sc 101 or 202.

Pol Sc 302—State and Local Government—3 cr. (3 and 0)

The structural features, functions, and legislative, executive and judicial processes of American state and local government.

Pol Sc 321—General Public Administration—3 cr. (3 and 0)

An introduction to public administration including the elements of organization, personnel and financial management, and administrative law, and administrative responsibility. *Prerequisite:* Pol Sc 101 or 301, 201.

Pol Sc 331—Constitutional Development of the United States—3 cr. (3 and 0)

The origin and growth of the Constitution of the United States. *Prerequisite:* Pol Sc 101, or 201.

Pol Sc 341—Political Behavior—3 cr. (2 and 3)

An introduction to behavioral methods. Identification of regularities in the type, degree, and direction of political participation. Laboratory training and field work in interviewing. *Prerequisite:* Junior standing and permission of instructor.

Pol Sc 351—Classical Political Thought—3 cr. (3 and 0)

Political philosophy from the pre-Socratic period to Machiavelli. *Prerequisite:* Pol Sc 101 or 301, 201.

Pol Sc 352—Modern Political Thought—3 cr. (3 and 0)

The early theories of the nation state in the sixteenth century and the major political thinkers, problems and movements through the twentieth century. *Prerequisite*: Pol Sc 101 or 301, 201.

Pol Sc 361—International Politics—3 cr. (3 and 0)

An introduction to foreign policy, international law, and international organizations. *Prerequisite:* Pol Sc 101 or 301, 201.

Pol Sc 371—Comparative European Governments I; Constitutional Systems—3 cr. (3 and 0)

Major emphasis on the United Kingdom, France, Germany, and the U.S.S.R., with brief attention given to Italy and Switzerland. Current methods of comparison will be studied and applied to the formal and informal functioning of these governments. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 372—Comparative European Government II; Totalitarian Systems—3 cr. (3 and 0)

A continuation of Pol Sc 371. This course will deal specifically with the Soviet Union as an example of totalitarian political systems, with references made to Nazi Germany and the present Eastern European political systems. *Prerequisite:* Pol Sc 101 or 301, 201.

Pol Sc 403—Legislative Process—3 cr. (3 and 0)

Individual behavior and the decision-making process within legislatures; legislative functions; the relationship of legislatures to the executive and other entities in the political system. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 409—Directed Study in American Institutions—3 cr. (3 and 0)

Supervised reading and/or research in selected areas of American government. *Prerequisite:* 18 semester hours in political science and permission of instructor.

Pol Sc 422—Problems of Public Administration—3 cr. (3 and 0)

Selected views of public administration and the problems involved. *Prequisite:* Pol Sc 101 or permission of instructor.

Pol Sc 423—Municipal Administration—3 cr. (3 and 0)

Interaction of political, technical, and administrative processes in urban America. *Prerequisite:* Pol Sc 101 or permission of instructor.

Pol Sc 426—Government Organization Theory—3 cr. (3 and 0)
A study of the political-economic approach to the analysis of organization, management, and policy administration. Emphasis will be placed on organizational design, structure, and operation; participation and leadership; and evaluation of organizational effectiveness. *Prerequisite:* Pol Sc 321.

Pol Sc 428—National Defense Policy Analysis—3 cr. (3 and 0)
A study of the possibilities and problems in formulating policies of national defense. Examination of alternatives, consequences and effectiveness of current techniques in nuclear weaponry, guerilla and conventional warfare. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

Pol Sc 432—American Constitutional Law I—3 cr. (3 and 0)
A brief introduction to the judicial process followed by a detailed examination of leading cases pertaining to the judiciary, the Congress, the presidency, and the federal system. *Prerequisite:* Pol Sc 101 or 301, 201, and preferably 331.

Pol Sc 433—American Constitutional Law II—3 cr. (3 and 0)
An examination of the relationship of the individual to his government; focusing on the safeguards of liberty and property including freedoms of speech, press and religion, and criminal procedures. *Prerequisite:* Pol Sc 101 or 301, 201, and preferably 331.

Pol Sc 434—The Judicial Process and Jurisprudence—3 cr. (3 and 0)
Courts as political subsystems; judicial decision making; the development of public policy through the judicial process; theories of law and jurisprudence. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 442—Political Parties and Politics—3 cr. (3 and 0)
A study of the historical development of political parties, and the role they play in the organization and functions of our national government, and the influence of politics in policy making. *Prerequisite:* Pol Sc 101 or 301, and 201.

Pol Sc 443—Public Opinion and Propaganda—3 cr. (3 and 0)
This course examines the nature of public opinion, its social and political context, the social-psychological processes basic to it, the dynamics of its formation and change and its measurement. *Prerequisite:* Pol Sc 341, IM 410, or permission of instructor.

Pol Sc 462—International Organizations—3 cr. (3 and 0)
Emphasis on international organizations. Analysis of current problems and proposed solutions. *Prerequisite:* Pol Sc 101 (or 202 or 301), 201.

Pol Sc 463—United States Foreign Policy—3 cr. (3 and 0)
Focus on foreign policy in its historical perspective, examining the decision-making process in foreign policy; evaluates contemporary American capabilities, and analyzes specific issues. *Prerequisite:* Pol Sc 101 (or 202 or 301), 201.

Pol Sc 464—International Law—3 cr. (3 and 0)
An examination of cases and other legal materials on the nature of international law, recognition of states, succession, the territory of states, and nationality. *Prerequisite:* Pol Sc 101, 201.

Pol Sc 465—Foreign Policies of the Major Powers—3 cr. (3 and 0)
A study in the foreign policies of the leading world powers with special reference to the geographic, economic, historical and political determinants of each. A general introduction to the field of foreign policy. United States foreign policy is *not* emphasized. *Prerequisite:* Pol Sc 361.

Pol Sc 469—Proseminar in International Studies—3 cr. (3 and 0)
Assessment of various theories and methods employed in the systematic study of International Relations; class discussions, readings, and reports. *Prerequisite:* Pol Sc 101, 201, and permission of instructor.

Pol Sc 473—Politics of the Developing Nations—3 cr. (3 and 0)
A comparative analysis of the political and social problems of the developing nations of Africa, the Near East, East Asia, and Latin America. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

Pol Sc 479—Directed Study in Comparative Government—3 cr. (3 and 0)
A study of the several methodological approaches to the analysis of comparative politics, emphasizing individual research and readings. *Prerequisite:* Pol Sc 201, 371, or permission of instructor.

Pol Sc 609—Directed Study in American Institutions—3 cr. (3 and 0)

Pol Sc 632—American Constitutional Law I—3 cr. (3 and 0)

Pol Sc 662—International Organizations—3 cr. (3 and 0)

POULTRY SCIENCE

Professors: B. D. Barnett, *Head;* B. W. Bierer, M. A. Boone
Associate Professors: J. B. Cooper, J. E. Jones, D. E. Turk
Assistant Professor: J. Solis

PS 201—Introduction to Poultry Science—3 cr. (2 and 3) S
The application of the physical and biological sciences to modern poultry production and utilization. A study of the anatomy and physiology of the fowl and the economic aspects of poultry enterprises.

PS 352—Breeder Flock and Hatchery Management—3 cr. (3 and 0) F, '72 and alternate years.
Principles of genetics and physiology applicable to efficient multiplication of economically important avian species. The principles of embryology, incubation, hatchery organization and operation essential to production of healthy young birds.

PS 353—Breeder Flock and Hatchery Management Laboratory—1 cr. (0 and 3) F, '72 and alternate years.
Laboratory demonstrating material covered in PS 352.

PS 355—Poultry Products Grading and Technology—3 cr. (2 and 3) F, '73 and alternate years.
Factors important in the quality of poultry products will be considered. The effects of production, handling, packaging and storage on consumer acceptability will be discussed. Quality evaluation will be considered from the standpoint of tenderness, flavor, microbiology, and USDA grades.

PS 359—MANAGEMENT OF EGG, BROILER, AND TURKEY ENTERPRISES—3 cr. (2 and 3) S, '72 and alternate years.

The application of technology to the production of commercial eggs, broilers and market turkeys. The application of labor and equipment to animal requirements in such a way as to result in efficient production of wholesome meat and eggs.

PS 401—ANIMAL ENVIRONMENTAL TECHNOLOGY—2 cr. (2 and 0) F, '72 and alternate years.

Demonstration of measurement and control of certain environmental factors with emphasis on light, temperature, and ventilation. Demonstration of physiological response of animals to different environments. All domestic livestock will be considered.

PS 403—ANIMAL ENVIRONMENTAL TECHNOLOGY LABORATORY—1 cr. (0 and 3) F, '72 and alternate years.

Demonstration of subjects covered in PS 401.

PS 451—POULTRY NUTRITION—2 cr. (2 and 0) S, '72 and alternate years.

Nutrient requirements of the various classes of poultry and the use of feedstuffs in meeting these needs. *Prerequisite:* An Sc 301.

PS 458—AVIAN MICROBIOLOGY AND PARASITOLOGY—4 cr. (3 and 3) F, '72 and alternate years.

Agents causing poultry diseases; the diagnosis, prevention, and treatment of specific diseases and their economic and public health significance.

PS 460—SEMINAR—2 cr. (2 and 0) S, '73 and alternate years.

Current research reported in journals covering the various areas of poultry science. Students will practice scientific writing and interpretation of technical material for lay readers. *Prerequisite:* Permission of instructor.

PS 601—ANIMAL ENVIRONMENTAL TECHNOLOGY—2 cr. (2 and 0)

PS 603—ANIMAL ENVIRONMENTAL TECHNOLOGY LABORATORY—1 cr. (0 and 3)

PS 651—POULTRY NUTRITION—2 cr. (2 and 0)

PS 652—BREEDER FLOCK AND HATCHERY MANAGEMENT—3 cr. (3 and 0)

PS 653—BREEDER FLOCK AND HATCHERY MANAGEMENT LABORATORY—1 cr. (0 and 3)

PS 655—POULTRY PRODUCTS GRADING AND TECHNOLOGY—3 cr. (2 and 3)

PS 658—AVIAN MICROBIOLOGY AND PARASITOLOGY—4 cr. (3 and 3)

PS 659—MANAGEMENT OF EGG, BROILER, AND TURKEY ENTERPRISES—3 cr. (2 and 3)

PS 660—SEMINAR—2 cr. (2 and 0)

PS 804—POULTRY PATHOLOGY—3 cr. (1 and 6)

PS 805—SEMINAR—1 cr. (1 and 0)

PS 891—RESEARCH—Credit to be arranged.

PSYCHOLOGY

Associate Professors: C. B. Caffrey, S. N. Cole, J. D. Davenport

Assistant Professors: W. R. Fowler, Jr., J. D. Marx, T. G. Titus

Lecturer: D. K. Freeman, Jr.

Instructors: Marilyn A. Austin, Barbara Hinkle

Psych 201—General Psychology—3 cr. (3 and 0)

A survey of the field of psychology: development and adjustment, motivation, emotions, intelligence, personality, the sensory experiences, perception, learning, thinking, imagination, and mental hygiene.

Psych 202—Introductory Experimental Psychology—3 cr. (3 and 0)

A survey of the major areas of psychological research with emphasis on methods of experimentation and other forms of research. Required of all psychology majors and minors. *Prerequisite:* Psych 201.

Psych 211—Growth and Development—3 cr. (3 and 0)

The course will focus on changes in personal and social behavior throughout the human life span. *Prerequisite:* Psych 201.

Psych 302—Social Psychology—3 cr. (3 and 0)

The interaction between the individual and the forces of society: the classical theories, the psychobiological bases of human behavior, the sociocultural bases of behavior, types of human behavior, overt and covert experiences, symbolism, personality and social interaction. *Prerequisite:* Psych 201.

Psych 303—The Psychology of Adjustment—3 cr. (3 and 0)

A course in personal adjustment dealing with the appropriate and inappropriate reactions to frustration and stress, including ways of handling conflicts, anxiety, fears, and the promotion of personal emotional adjustment. *Prerequisite:* Psych 201, 202, or permission of instructor. Not open to psychology majors.

Psych 321—Developmental Psychology—3 cr. (3 and 0)

A survey of current theory and research concerned with the psychological aspects of human growth and development. *Prerequisite:* Psych 201, 202.

Psych 331—Theories of Learning—3 cr. (3 and 0)

A historical approach to the study of the major modern learning theories. *Prerequisite:* Psych 201, 202.

Psych 341—Physiological Psychology—3 cr. (3 and 0)

The study of human neuroanatomy, with an emphasis on the functions of the nervous system. Treats of the biological bases of behavior in both normal and abnormal dimensions. *Prerequisite:* Psych 201, 202.

Psych 351—History and Systems of Psychology—3 cr. (3 and 0)

A treatment of the science of psychology as understood in the light of the ideas of men who have been responsible for its development. *Prerequisite:* Psych 201, 202.

Psych 361—Motivation—3 cr. (3 and 0)

The various aspects of motivation are considered through a study of contributions of biologists, sociologists, anthropologists, and psychologists. The orientation is empirical rather than theoretical, with emphasis on pertinent research and research methods, and on the measurement of motives. *Prerequisite:* Psych 201, 202.

PSYCH 363—EXPERIMENTAL PSYCHOLOGY II—4 cr. (3 and 3)
A continuation of Experimental Psychology I, with a stress on the carrying out of original research in the scientific study of human and animal behavior. Laboratory periods stress the refinement of techniques and the execution of research in a guided setting. *Prerequisite:* Psych 201, 202.

PSYCH 380—COGNITIVE PROCESSES—3 cr. (3 and 0)
The study of higher cognitive functioning which includes such areas as memory, concept acquisition, the acquisition and use of language, speech perception, pattern recognition, and problem solving. *Prerequisite:* Psych 201, 202.

PSYCH 401—APPLIED PSYCHOLOGY—3 cr. (3 and 0)
A study of the concepts of psychology as applied to individual, business, and professional behavior. *Prerequisite:* Psych 201.

PSYCH 402—ABNORMAL PSYCHOLOGY—3 cr. (3 and 0)
Mental and emotional disorders: theories of causation and problems of treatment; special phenomena of consciousness and unconsciousness, *e.g.*, dreams, dissociation, hypnosis; analysis of pathological behavior: alcoholism, drug addiction, suicide, criminality, neurosis, and psychoneurosis. *Prerequisite:* Psych 201.

PSYCH 403—PERSONALITY—3 cr. (3 and 0)
An analysis of the theories of personality: Freud, Adler, Jung, Sullivan, Horney, Allport, *et al. Prerequisite:* Psych 201, 202, and permission of instructor.

PSYCH 422—CROSS CULTURAL STUDIES IN DEVELOPMENTAL PSYCHOLOGY—3 cr. (3 and 0)
A comparative study of the development of human behavior and personality emphasizing the contributions of learning theory, psychoanalysis, role theory, and cultural anthropology. *Prerequisite:* Psych 201, 202, 321, 331 or 361, 402, or 403, or permission of instructor.

PSYCH 432—CONDITIONING AND LEARNING—3 cr. (3 and 0)
A comprehensive study of the principles of learning. Includes classical, instrumental, and operant conditioning paradigms. A detailed study of reinforcement, acquisition, generalization, discrimination, and extinction of behavioral responses. *Prerequisite:* Psych 201, 202, 331, Math 203.

PSYCH 442—SENSATION AND PERCEPTION—3 cr. (3 and 0)
Current experimental findings in the field of perception and sensation, along with theories of vision, audition, kinesthesis, vestibular function, the skin and chemical senses and theories of perception. *Prerequisite:* Psych 201, 202, 341.

PSYCH 471—PSYCHOMETRICS—3 cr. (3 and 0)
An introduction to the theory of psychological testing. Emphasis is on essentials of testing with experience in administering, scoring, and interpreting test, including those of scholastic achievement, mental ability, scholastic aptitude, interests and personality. *Prerequisite:* Nine hours of psychology including 201, 202.

PSYCH 475—GROUP DYNAMICS—3 cr. (3 and 0)
A review of current research and theory on small-group processes with special emphasis on group structure, the dynamic forces within a group, social power, group problem solving, and leadership. *Prerequisite:* Psych 201, 202, 363, or permission of instructor.

PSYCH 490—SPECIAL TOPICS IN PSYCHIATRY AND NEUROLOGY—3 cr. (3 and 0)
Selected aspects of medical sciences related to clinical psychology—psychiatric examination and nosology, central nervous system pathology, psychopharmocology, child psychiatry, etc.—designed to assist the psychologist in working effectively with representatives of these disciplines. *Prerequisite:* Psych 201, 202, 402, 403, and/or permission of instructor.

PSYCH 495—DIRECTED RESEARCH IN BEHAVIOR—2 cr. (2 and 0)
Consists of individual research projects carried out by students under the direct guidance of a particular faculty member. The research will be conducted in psychology or in a related field, provided that key variables are related to human or animal behavior. *Prerequisite:* Psych 363 completed; status as a senior.

PSYCH 498—SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY—2 cr. (2 and 0)
Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, 363, or permission of instructor.

PSYCH 499—SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY II—3 cr. (3 and 0)
Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, 363, or permission of instructor.

RECREATION AND PARK ADMINISTRATION

Professor: H. BRANTLEY, *Head*

Associate Professors: G. E. HOWARD, J. L. STEVENSON

Assistant Professors: R. M. FRYE, L. W. GAHAN, SARAH A. WALKER, C. R. WHITE

Instructor: R. E. BARKER

Lecturers: C. E. GODFREY, JR., J. R. VAUGHN

RPA 101—INTRODUCTION TO COMMUNITY RECREATION—3 cr. (3 and 0)
History and foundations of Community Recreation in public, private and commercial settings; job opportunities, specifications and demands.

RPA 102—HISTORY AND PRINCIPLES OF OUTDOOR RECREATION—3 cr. (3 and 0)
Includes the study of the history, present status and the principles of operation of parks and park systems in America; outdoor education programs; implications for continued growth of this leisure phenomenon.

RPA 203—Personal and Community Health—3 cr. (3 and 0)

The course deals with health problems, disease prevention and control, school health practices, public health administration, and other health information which may enable one to live intelligently in today's complex society.

RPA 204—Sports in Recreation—3 cr. (2 and 3)

Administrative and supervisory skills indigenous to public and/or private agency athletic programs are considered. Group instruction is given in individual and team sports and officiating techniques applicable to these sports are taught.

RPA 205—Program Planning for Recreation—3 cr. (2 and 3)

Course includes fields of activity available to participants; principles and methods of program development; utilization of time-blocks and facilities. (Formerly RPA 303.) *Prerequisite:* Junior standing.

RPA 302—Camp Organization and Administration—3 cr. (2 and 3)

Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables student to master the techniques of group living. Laboratory offers practical experience in camp craft inoluding trips and outdoor cooking.

RPA 304—Recreation in Modern Society—3 cr. (3 and 0)

A historical study of the growth of leisure with special attention given to the utilization of community resources for recreation.

RPA 305—Physical Aspects of Sports in Recreation—3 cr. (2 and 3)

The course considers the physiology of exercise as it relates to safety in recreational sports programs, the practice of first aid, and the treatment of athletic injuries.

RPA 306—Principles of Outdoor Education—3 cr. (3 and 0)

A study of the development of outdoor education in public, private and professional agencies with special emphasis on schools and park and recreation departments. Attention will be focused on our National land problems and on land needs for tomorrow.

RPA 307—Park Maintenance and Operation—4 cr. (3 and 3)

Maintenance techniques and materials, interpretive programs, job planning and scheduling, problems of overuse and preventive maintenance are included. (Formerly RPA 401.)

RPA 308—Methods and Techniques of Recreation Leadership—3 cr. (3 and 0)

Considers characteristics of the several levels of recreation leadership with special emphasis on supervision. Examination is made of the Group Processes. Also includes a study of community resources for leadership in specialized program areas.

RPA 402—Recreation Administration—3 cr. (3 and 0)

An analysis of the internal organization of a recreation department dealing with finances and accounting; records and reports; publicity and public relations; state and federal legislation; staff organization; coordination of community resources. *Prerequisite:* Senior standing.

RPA 403—Facility and Site Planning—3 cr. (2 and 3)
Trends in recreation facility development, planning principles involved in design of recreation buildings, and orientation of facilities to given area are integrated into sound planning programs. *Prerequisite:* RPA 307 or permission of instructor.

RPA 405—Field Training in Recreation—8 cr.
The student, in a ten-week program, has the opportunity to observe recreation programs in operation. He will also have responsibilities of organizing and conducting activities under supervision. Maintenance and operation of facilities will be observed and practiced. Total of 360 hours required. *Prerequisite:* Senior standing.

RPA 406—Recreation for the Ill and Handicapped—3 cr. (3 and 0)
Surveys the recreational opportunities and benefits available to the ill and handicapped citizens. Designed to provide the student with an awareness of the role of the professional recreator in serving the needs of such special groups as the mentally retarded, cerebral palsied, emotionally disturbed—institutionalized, hospitalized, etc. Particular emphasis will be given to program development applicable to each specific situation.

RPA 408—The Application of Recreation Therapy—3 cr. (3 and 0)
The study of the responsibility and role of the recreator as a member of the therapeutic team.

RPA 409—Methods of Recreation Research I—3 cr. (3 and 0)
An analysis of the principle methods of recreation research, the application of descriptive statistics to recreation research, and the development of a research proposal. *Prerequisite:* Senior standing and permission of instructor.

RPA 410—Methods of Recreation Research II—3 cr. (3 and 0)
A continuation of RPA 409 to include the supervised execution and reporting of the results of the research proposal developed in RPA 409 and the application of inferential statistics to recreation research. *Prerequisite:* RPA 409 or permission of instructor.

RPA 602—Recreation Administration—3 cr. (3 and 0)

RPA 606—Recreation for the Ill and Handicapped—3 cr. (3 and 0)

RPA 701—Philosophical Foundations of Recreation and Park Administration—3 cr. (3 and 0)

RPA 702—Group Processes in Leisure Services—3 cr. (3 and 0)

RPA 703—Seminar in Recreation and Park Administration—3 cr. (3 and 0)

RPA 704—Comprehensive Recreation Planning—3 cr. (3 and 0)

RPA 705—Recreational Aspects of Water Resources—3 cr. (3 and 0)

RPA 706—Urban Recreation Analysis—3 cr. (3 and 0)

RPA 707—Principles of Environmental Interpretation—3 cr. (3 and 0)

RPA 708—Selected Topics—3 cr. (3 and 0)

RELIGION

Assistant Professor: D. F. White, Jr.

Rel 301—The Old Testament—3 cr. (3 and 0)
A survey of books of the Old Testament with special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

Rel 302—A Survey of New Testament Literature—3 cr. (3 and 0)
A study of the books of the New Testament from the standpoint of their occasion, content, literary form, and basic theology.

Rel 306—Religions of the West—3 cr. (3 and 0)
A study of the origin, evolution, and contemporary status of Judaism, Christianity, and Islam. *Prerequisite:* Junior standing.

Rel 309—Religions of the Far East—3 cr. (3 and 0)
A study of the origin, evolution, and contemporary status of Hinduism, Buddhism, Confucianism, and Taoism. *Prerequisite:* Junior standing.

RURAL SOCIOLOGY

Professor: W. J. Lanham, *Head*

Associate Professor: V. A. Boyd

Assistant Professor: E. L. McLean

RS 301—Rural Sociology—3 cr. (3 and 0) F, S
A study of human social relationships as influenced by life in the open country and in small towns and villages including considerations of the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

RS 359—The Community—3 cr. (3 and 0) F
An examination of the sociological aspects of contemporary communities and of their growth and development. The structural relations of social class, status and power and the relationships among social institutions within the community are examined. Emphasis is placed on the organization and development of communities in a constantly changing environment.

RS 401—Human Ecology—3 cr. (3 and 0)
Analysis of the interrelationships between man and his natural and man-made environments; study of settlement patterns, social organization, and institutions of human populations. Special emphasis will be given to interdependence of natural resources, human resources, and man-land relationships.

RS 461—Rural Leadership—3 cr. (3 and 0) S
A consideration of the social and psychological factors involved in leadership including an examination and analysis of characteristics of the successful leader. Particular attention is paid to the role of the leader in the process of economic and social development of rural communities and small towns.

RS 601—Human Ecology—3 cr. (3 and 0)

RS 659—The Community—3 cr. (3 and 0)

RS 661—Rural Leadership—3 cr. (3 and 0)

RS 801—Rural Social Systems—3 cr. (3 and 0)

RUSSIAN

Lecturer: Ludmila A. Savitsky

Russ 101—Elementary Russian—4 cr. (3 and 1)

Training in pronunciation, grammatical forms, and syntax with a view of giving the student the fundamentals necessary to read simple Russian texts. Three hours a week classroom instruction and one hour a week in the language laboratory.

Russ 102—Elementary Russian—4 cr. (3 and 1)

A continuation of Russ 101; three hours a week classroom instruction and one hour a week in the language laboratory.

Russ 201—Intermediate Russian—3 cr. (3 and 0)

The reading of simple Russian prose; a review of grammar and syntax. Drill on vocabulary and idiom. *Prerequisite:* Russ 101, 102.

Russ 202—Intermediate Russian—3 cr. (3 and 0)

A continuation of Russ 201.

Russ 303—Survey of Russian Literature I—3 cr. (3 and 0)

Literary movements and authors from the beginning to 1850. *Prerequisite:* Russ 201, 202.

Russ 304—Survey of Russian Literature II—3 cr. (3 and 0)

Literary movements and authors from 1850 to the present. *Prerequisite:* Russ 201, 202.

SOCIOLOGY

Professor: F. A. Burtner

Assistant Professors: W. C. Capel, Jr., R. J. Knapp, G. S. Rent

Instructors: Helen L. Fleischman, R. N. Pippin, S. K. Shernock, D. A. Smith, J. M. Turner

Soc 201—Introductory Sociology—3 cr. (3 and 0)

The basic principles of sociology: culture, biological factors, the influence of geographical environment, human nature, group life, social stratification, communities, social institutions, and social change. *Prerequisite:* Sophomore standing.

Soc 202—Social Problems—3 cr. (3 and 0)

A survey of the major social problems, including problems of industry, education, religion, disease and public health, poverty, dependency and factors affecting social adjustment. *Prerequisite:* Soc 201.

Soc 206—Introduction to Methods of Sociological Research—3 cr. (3 and 0)

An introduction to the use of scientific methods in sociology, their purpose, and limitations; the relationship between theory and research; research design, sampling, measurement and the social science techniques of reliability and validity. Required of all Sociology majors and minors. *Prerequisite:* Soc 201.

Soc 306—Contemporary Socio-environmental Problems—3 cr. (2 and 2)

A multidisciplinary study of national, social and environmental issues. Topics will include: regional population concerns, housing needs, regional health problems, the environment—air, water, land—delivery of justice, automation and technological change. *Prerequisite:* Junior standing or consent of instructor.

Soc 311—The Family—3 cr. (3 and 0)
The family as one of the basic institutions of society. The history of the family, and a study of its functions in early and modern social structures. A comparative study of family life in other cultures is made. *Prerequisite:* Soc 201, 206.

Soc 321—Cultural Anthropology—3 cr. (3 and 0)
Recent and contemporary man, as a social and culture-bearing animal, with emphasis on the constants and variants in human behavior involved in technology, social relations, language, religion, art, and other aspects of cultures. *Prerequisite:* Soc 201, 206.

Soc 322—Cultural Anthropology—3 cr. (3 and 0)
A continuation of Soc 321. *Prerequisite:* Soc 321.

Soc 324—Social and Cultural Change—3 cr. (3 and 0)
An examination of theory and research on the processes of change; factors inducing or inhibiting change; the character, mechanisms, rate, extent, direction, and relative stabilization of change at different levels of social phenomena. *Prerequisite:* Soc 201, 206.

Soc 331—Urban Sociology—3 cr. (3 and 0)
A survey of the history and development of modern urban organization; rise of the city; problems of modern urban life. *Prerequisite:* Soc 201, 206 (for Sociology majors and minors).

Soc 341—Population Analysis—3 cr. (3 and 0)
An analysis of population growth and distribution and their bearing on current economic, political, and social problems. *Prerequisite:* Soc 201, 206.

Soc 351—Industrial Sociology—3 cr. (3 and 0)
Industry as a social organization; the factory as a social system; personality in industrial relations; power groupings within industry; industry and the community. *Prerequisite:* Soc 201 and permission of instructor.

Soc 361—Collective Behavior—3 cr. (3 and 0)
Examination of the nature, development and consequences of human behavior in situations where usual social norms and behavior do not apply. Particular attention to such collective behavior phenomena as crowds, mobs, mass, cults, publics, and the initial states of social movements. *Prerequisite:* Soc 201, 206.

Soc 371—Research Methods—3 cr. (3 and 0)
Analysis of scientific methods in social research and consideration of various techniques, methodological approaches and research designs. Required of all sociology majors. *Prerequisite:* Soc 201, 206, Ex St 301.

Soc 381—Society and Socialization—3 cr. (3 and 0)
The relationship between social structure and personality. *Prerequisite:* Soc 201, 206.

Soc 391—Sociology of Deviant Behavior—3 cr. (3 and 0)
Analysis of advanced theory and research on the social processes by which behavior becomes defined as deviant, the conditions promoting such behavior, and the career patterns of deviant persons. *Prerequisite:* Soc 201, 206.

Soc 393—Crime and Delinquency—3 cr. (3 and 0)
An overview of the area of crime and delinquency. The course will focus upon theories of criminology, the etiology of crime and delinquency, and the administration of criminal justice. *Prerequisite:* Soc 201, 206.

Soc 411—Classical Sociological Theory—3 cr. (3 and 0)
A survey of sociological theory from Comte to Durkheim. Required of all sociology majors. *Prerequisite:* 9 semester hours in sociology.

Soc 421—Contemporary Sociological Theory—3 cr. (3 and 0)
A survey of sociological theory from Durkheim to the present. Required of all sociology majors. *Prerequisite:* Soc 201, 206, 411.

Soc 431—Complex Organizations—3 cr. (3 and 0)
An examination and comparison of theories of formal organization; and analysis of the structure and function of specific organizations illustrating various theoretical approaches. *Prerequisite:* Soc 201, 206.

Soc 441—Social Stratification—3 cr. (3 and 0)
Analysis of social structure in terms of class, status, prestige, rank and function. Attention is given to the social role of the elite, bureaucracies, the professional, and middle classes. *Prerequisite:* Soc 201, 206.

Soc 451—Sociology of Medicine—3 cr. (3 and 0)
Consideration of the major contributions of sociology to medicine; an exploration of patterned social relationships in the field of health and medicine. *Prerequisite:* Soc 201, 206.

Soc 481—Race Relations—3 cr. (3 and 0)
The study of the problem of racial and ethnic groups in adjusting to American society. The nature and causes of prejudice and discrimination. Programs for the reduction of intergroup tensions and conflicts are evaluated in the light of observed facts and sociological principles. *Prerequisites:* Soc 201, 206, or permission of instructor.

Soc 499—Seminar in Selected Topics in Contemporay Sociology—3 cr. (3 and 0)
Required of all sociology majors. *Prerequisite:* Soc 201, 206, 411, 421, or permission of senior adviser.

Soc 611—Classical Sociological Theory—3 cr. (3 and 0)

Soc 621—Contemporary Sociological Theory—3 cr. (3 and 0)

Soc 631—Complex Organizations—3 cr. (3 and 0)

Soc 641—Social Stratification—3 cr. (3 and 0)

Soc 651—Sociology of Medicine—3 cr. (3 and 0)

Soc 781—Race Relations—3 cr. (3 and 0)

SPANISH

Associate Professor: G. J. FERNANDEZ

Assistant Professors: S. C. KING, R. F. MIXON, P. F. PARRADO, L. E. SEAMON, J. M. WHITMIRE

Instructors: B. G. DURHAM, L. T. PERRY

Lecturer: ELENA G. FERNANDEZ

SPAN 101—ELEMENTARY SPANISH—4 cr. (3 and 1)
A course for beginners in which the essentials of grammar are taught and a foundation is provided for a conversational and reading knowledge of the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

SPAN H101—ELEMENTARY SPANISH—4 cr. (3 and 1)
Honors section of Span 101; admission by invitation.

SPAN 102—ELEMENTARY SPANISH—4 cr. (3 and 1)
A continuation of Span 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

SPAN H102—ELEMENTARY SPANISH—4 cr. (3 and 1)
Honors section of Span 102; admission by invitation.

SPAN 201—INTERMEDIATE SPANISH—3 cr. (3 and 0)
Grammar, vocabulary, and idioms; conversation, composition, and translation. *Prerequisite:* Span 102.

SPAN H201—INTERMEDIATE SPANISH—3 cr. (3 and 0)
Honors section of Span 201; admission by invitation.

SPAN 202—INTERMEDIATE SPANISH—3 cr. (3 and 0)
Introduction to Spanish literature: representative short stories, essays, novels, poetry, and plays. *Prerequisite:* Span 201.

SPAN H202—INTERMEDIATE SPANISH—3 cr. (3 and 0)
Honors section of Span 202; admission by invitation.

SPAN 303—SURVEY OF SPANISH LITERATURE I—3 cr. (3 and 0)
Literary movements, influences, and authors from the beginnings to the end of the seventeenth century. Representative works, discussions. Required of Spanish majors. *Prerequisite:* Span 201, 202.

SPAN 304—SURVEY OF SPANISH LITERATURE II—3 cr. (3 and 0)
Literary movements, influences, and authors from the eighteenth century to the present. Required of Spanish majors. *Prerequisite:* Span 201, 202.

SPAN 305—CONVERSATIONAL SPANISH—3 cr. (3 and 0)
Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Some written work to increase accuracy. Required of Spanish majors. Assignments in the language laboratory. *Prerequisite:* Span 201.

SPAN 306—ADVANCED CONVERSATION WITH COMPOSITION—3 cr. (3 and 0)
A continuation of Span 305 with more emphasis on written Spanish. *Prerequisite:* Span 305.

SPAN 307—SPANISH CIVILIZATION—3 cr. (3 and 0)
A study of the significant aspects of the culture of Spain from its origins to the present. *Prerequisite:* Span 202 or permission.

SPAN 308—SPANISH AMERICAN CIVILIZATION—3 cr. (3 and 0)
A study of the significant aspects of the culture of Spanish American countries from the Colonial period to the present. *Prerequisite:* Span 202 or permission.

SPAN 309—INTRODUCTION TO SPANISH PHONETICS—3 cr. (3 and 0)
A study of the fundamental principles of the pronunciation of Spanish. *Prerequisite:* Span 201 or equivalent.

SPAN 310—SURVEY OF SPANISH AMERICAN LITERATURE I—3 cr. (3 and 0)
A study of Spanish American literature from the Colonial period to Modernism. *Prerequisite:* Span 202 or permission of the Head of the Department of Languages.

SPAN 311—SURVEY OF SPANISH AMERICAN LITERATURE II—3 cr. (3 and 0)
Literary movements, influences, authors, and works from Modernism to the present. *Prerequisite:* Span 202 or permission of the Head of the Department of Languages.

SPAN 401—CONTEMPORARY SPANISH LITERATURE—3 cr. (3 and 0)
Literary trends and representative authors since 1898. *Prerequisite:* Span 303 or 304.

SPAN 402—CONTEMPORARY SPANISH DRAMA—3 cr. (3 and 0)
The Spanish theater from Benavente to the present. *Prerequisite:* Span 303 or 304.

SPAN 405—NINETEENTH CENTURY SPANISH LITERATURE—3 cr. (3 and 0)
Representative authors and movements of the nineteenth century; Romanticism, *costumbrismo,* and the regional novel. *Prerequisite:* Span 303, 304.

SPAN 406—CERVANTES AND THE GOLDEN AGE—3 cr. (3 and 0)
A study of Cervantes and the theater of the Golden Age of Spanish literature. *Prerequisite:* Span 303 or 304.

SPAN 409—ADVANCED GRAMMAR AND COMPOSITION—3 cr. (3 and 0)
An intensive study of syntax and stylistics through composition and translations. *Prerequisite:* Senior standing or permission of the Head of the Department of Languages.

SPAN 498—INDEPENDENT STUDY—1-3 cr. (1-3 and 0)
Independent in-depth study of selected topics in Spanish literature. *Prerequisite:* Permission of the Head of the Department of Languages.

TECHNICAL OPERATIONS

Professor: E. Laitala, *Program Director*
Associate Professor: R. L. Perry

TO 301—Mechanics I—3 cr. (2 and 3)
A study of statics including force systems and friction, dynamics of particles and rigid bodies; and, kinetics including forces, mass and acceleration, work and energy, impulse and momentum. *Prerequisite:* Phys 208, concurrent registration in Math 206.

TO 302—Mechanics II—3 cr. (2 and 3)
Mechanical properties of solids and fluids. Stress analysis in solids; beams, columns and cylinders. Hydrostatic systems. Energy and flow characteristics of fluid dynamic systems. *Prerequisite:* TO 301.

TO 311—Electrical Circuits I—3 cr. (3 and 0)
A study of direct and alternating current circuits. Circuit theorems are introduced in the direct current coverage and are reinforced during the study of alternating currents. Emphasis is placed on steady state conditions and power relationships in circuits with sinusoidal excitations. *Prerequisite:* Phys 208, concurrent registration in Math 206.

TO 312—Electrical Circuits II—3 cr. (3 and 0)
Continuation of Electrical Circuits I. A thorough coverage of polyphase circuits is included. *Prerequisite:* TO 311.

TO 321—Heat Power I—3 cr. (3 and 0)
First and second laws of thermodynamics, thermodynamic properties, gas mixtures and thermodynamic processes. *Prerequisite:* Phys 208, concurrent registration in Math 206.

TO 322—Heat Power II—3 cr. (3 and 0)
Internal combustion engines, gas turbines, air compressors, flow in nozzles, refrigeration and steam power plant cycles, and heat transfer. *Prerequisite:* TO 321.

TO 331—Heat Power Laboratory—1 cr. (0 and 3)
The course is intended to illustrate theory covered in heat power and in air-conditioning; to develop experimental technique; to interpret data and results; and to develop basic skills in technical report writing. *Prerequisite:* TO 321 and registration in 322.

TO 341—Kinematics of Machines—2 cr. (1 and 3)
A study of displacements, velocities, and accelerations encountered in the design of machines using the graphical approach to the solution of problems. The use of these principles applied to the study of cams, gears, and miscellaneous mechanisms. *Prerequisite:* EG 110, TO 301.

TO 411—Electrical Machinery—3 cr. (3 and 0)
Coverage includes the theory of operation and application of D-C and A-C machines and transformers. External characteristics are depicted from the machine equivalent circuit. *Prerequisite:* TO 312.

TO 412—Elements of Electronics—2 cr. (2 and 0)
Theory and operation of electronic circuits and control with emphasis on equipment for industrial application. *Prerequisite:* TO 311.

TO 421—HEATING AND AIR-CONDITIONING—2 cr. (2 and 0)
Psychrometric properties and processes; heating and cooling load calculations; selection and layout of major equipment for heating systems and air-conditioning systems, refrigeration and automatic controls. *Prerequisite:* TO 322.

TO 431—ELECTRICAL LABORATORY—1 cr. (0 and 3)
A laboratory course designed to complement instruction in TO 311, 312, 411. *Prerequisite:* TO 311, 312, and concurrent registration in 411.

TO 441—MACHINE AND COMPONENT DESIGN—3 cr. (2 and 3)
Basic instruction in the design and analysis of machine and machine components with emphasis on realistic and functional application. Kinematic and dynamic characteristics of the mechanical system together with wear, fatigue, structural soundness, safety, etc., will be a major consideration of the analysis. *Prerequisite:* TO 302, 341.

TEXTILE CHEMISTRY

Professors: T. D. EFLAND, J. C. HUBBARD, F. T. SIMON

Associate Professors: R. H. BARKER, D. W. LYONS, E. S. OLSON, J. J. PORTER, C. W. ROBERTS

TC 303—TEXTILE CHEMISTRY—3 cr. (3 and 0)
A study of the properties and reactions of aliphatic and aromatic organic compounds. Emphasis will be placed on mechanistic interpretations and the development of synthetic schemes leading to polyfunctional compounds of the types encountered in the textile industry. *Prerequisite:* Ch 102, Math 206.

TC 304—TEXTILE CHEMISTRY—3 cr. (3 and 0)
Fundamental principles of physical and organic chemistry with emphasis on those areas most frequently encountered in the textile industry including thermodynamics, kinetics, and solution properties. These concepts will be applied to the study of aliphatic organic compounds and organic reaction mechanisms. The basic principles of stereochemistry and conformational analysis will be developed. *Prerequisite:* TC 303.

TC 305—TEXTILE CHEMISTRY LABORATORY—1 cr. (0 and 3)
An introduction to the techniques used in the synthesis and characterization of organic compounds. To be taken concurrently with TC 303.

TC 306—TEXTILE CHEMISTRY LABORATORY—1 cr. (0 and 3)
The techniques used in the synthesis of organic compounds and the measurement of their physio-chemical properties. To be taken concurrently with TC 304.

TC 315—INTRODUCTION TO POLYMER SCIENCE AND ENGINEERING—3 cr. (3 and 0)
The chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Kinetics of polymerization, molecular characterization, structure, morphology, and mechanical properties of polymers are studied demonstrating design of polymer systems for end use in textiles.

TC 316—CHEMICAL PREPARATION OF TEXTILES—3 cr. (2 and 3)
The chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers.

Colloidal and surface active properties of various compounds and the fundamental factors influencing these properties. *Prerequisite:* TC 315.

TC 317—POLYMER AND FIBER LABORATORY—1 cr. (0 and 3)
High polymers, prepared from monomers, are characterized and spun to make fibers. Chemical and physical properties of fiber forming polymers are measured as functions of parameters critical to properties of textiles.

TC 457—DYEING AND FINISHING I—3 cr. (3 and 0)
A study of the different classes of dyestuffs and the chemistry of their applications to different fibers. The theories, principles and mechanisms for the dyeing of textile fibers and fabrics will be presented as well as the reaction mechanisms of various finishing agents applied to different substrates. *Prerequisite:* TC 315.

TC 458—DYEING AND FINISHING II—3 cr. (3 and 0)
The kinetics and equilibria of dyeing processes. The use of conductivity, diffusion and other methods useful for measuring absorption isotherms and dyeing rates and the general thermodynamic relationships applicable to dyeing operations. Fiber properties such as zeta potential dye sites, relative amorphous area available will be included.

TC 459—DYEING AND FINISHING LABORATORY I—1 cr. (0 and 3)
To be scheduled concurrently with TC 457. The course will introduce the student to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations.

TC 460—DYEING AND FINISHING LABORATORY II—1 cr. (0 and 3)
To be scheduled concurrently with TC 458. The course will cover finishing in addition to dyeing operations and their instrumental control.

TC 461—SEMINAR AND RESEARCH—3 cr. (1 and 6)
An original investigation of a problem in textile or polymer chemistry under the direct supervision of a faculty member. After completing his experimental work, the student prepares a formal, written report which he defends before the textile faculty. *Prerequisite:* Senior standing or permission of instructor.

TC 466—TEXTILE UNIT OPERATIONS—3 cr. (3 and 0)
Designed to cover some of the principles behind textile equipment operation such as heat transfer in drying and dyeing processes and fluid flow in pressure and open dye operations and polymer production.

TC 475—CELLULOSE CHEMISTRY—2 cr. (2 and 0)
The organic chemistry of cellulose and its derivatives is developed from the basic principles of carbohydrate chemistry. Emphasis is placed in the substitution and degradation reactions which are of particular importance in textile applications. Fiber morphology is treated in relation to its effect on textile chemical processing. *Prerequisite:* TC 315 or permission of instructor.

TC 615—INTRODUCTION TO POLYMER SCIENCE AND ENGINEERING—3 cr. (3 and 0)

TC 616—CHEMICAL PREPARATION OF TEXTILES—3 cr. (2 and 3)

TC 657—DYEING AND FINISHING I—3 cr. (3 and 0)

TC 658—DYEING AND FINISHING II—3 cr. (3 and 0)

TC 659—Dyeing and Finishing Laboratory I—1 cr. (0 and 3)

TC 666—Textile Unit Operations—3 cr. (3 and 0)

TC 675—Cellulose Chemistry—2 cr. (2 and 0)

TC 811—Polymer Science I—3 cr. (3 and 0)

TC 812—Polymer Science II—3 cr. (3 and 0)

TC 821—Chemistry of Natural Polymers—3 cr. (3 and 0)

TC 822—Chemistry of Natural Polymers II—3 cr. (3 and 0)

TC 831—The Physical Chemistry of Dyeing—3 cr. (3 and 0)

TC 891—Research—Credit to be arranged.

TEXTILE SCIENCE

Professors: T. D. Efland, J. C. Hubbard, Jr., F. T. Simon, J. V. Walters
Associate Professors: H. M. El-Behery, D. W. Lyons, J. H. Marvin, Jr., E. S. Olson, J. J. Porter
Assistant Professor: E. A. Vaughn
Lecturer: W. C. Laffoday

Text 122—Introduction to Textiles—1 cr. (1 and 0)
An introduction to the broad fields of textile, fiber and polymer science and engineering with emphasis on the description and formation of polymers, fibers, yarns, and fabrics including nonwoven structures and the dyeing, finishing, and chemistry and physics of textiles, fibers and polymers.

Text 301—Fiber Processing I—3 cr. (2 and 3)
A study of fibrous materials and their relationship to the fiber processing systems. The objectives, theories, principles, and mechanisms of the machines used in the earlier stages of fiber processing. The course is directed primarily to the staple fiber processing systems. Mechanical and mathmetical fundamentals are applied to the machines concerned.

Text 302—Fiber Processing II—3 cr. (2 and 3)
Continuation of Text 301 emphasizing the later stages of fiber processing for the ultimate yarn strand. *Prerequisite:* Text 301.

Text 305—Basic Fibers—3 cr. (3 and 0)
A thorough survey of the origin, characteristics and properties of various textile fibers, both natural and man-made. The classification, identification, and the principal fields of applications will be studied.

Text 306—Yarn Formation—3 cr. (3 and 0)
A fundamental study of the various systems of yarn formation from natural and man-made fibers and their blends. The course provides for the basic understanding of machines, theories and operations.

Text 311—Fabric Development I—3 cr. (2 and 3)
A study of the basic theory underlying the operation of the primary and secondary motions of the cam loom weaving machine. Students learn the principles of designs of the basic plain, twill, and sateen fabrics; and other weaves derived from these basic weaves. Special weaves such as the honey-

comb, the mock leno, and the huckaback weave. Weave analysis and preparation of necessary drafts are essential parts of the study of elementary textile design.

TEXT 312—FABRIC DEVELOPMENT II—3 cr. (2 and 3)
A study of the theory and operation of the dobby head, Knowles head, Staubli dobby, Jacquard head, and multicolor selection for the above looms. Weave design for compound fabrics using two or more systems of warp and filling threads for three dimensional weaves, weave analysis, and preparation drafts are covered. *Prerequisite:* Text 311.

TEXT 313—FABRIC FORMATION—3 cr. (3 and 0)
An examination of the theories involved in the assembly of fibers and yarns into fabrics. The application of design, analysis and production of woven, knitted and nonwoven fabrics. A brief survey of the fabric producing machines.

TEXT 314—DYEING AND FINISHING—3 cr. (3 and 0)
The concepts of current procedures and future trends in the textile finishing industry are examined. The preparation of fabrics, dye processes and the application of various materials used in the finishing process are presented.

TEXT 321—FIBER SCIENCE—3 cr. (2 and 3)
Fiber properties and the scientific evaluation of these properties. Dimensional, mechanical, optical, electrical, thermal, and moisture relationships are established and investigated.

TEXT 322—PROPERTIES OF TEXTILE STRUCTURES—3 cr. (2 and 3)
Yarn and fabric properties, their scientific significance and analysis. Dimensional, structural, and mechanical interrelationships are established and evaluated.

TEXT 324—TEXTILE STATISTICS—3 cr. (3 and 0)
An introduction to statistics with particular application to the Textile Industry. Measures of central value and variation, probability, the normal curve, tests of hypotheses, elementary correlation and regression. *Prerequisite:* Junior standing.

TEXT 333—THE TEXTILE ARTS—3 cr. (2 and 3)
A survey of the textile arts from prehistoric times to the present with emphasis on the correlation between man's accomplishments in these arts and his progress from the simple tools of ancient origin to the automated systems currently employed in industry.

TEXT 401—POLYMER AND FIBER MECHANICS—3 cr. (3 and 0)
Study of elasticity theory and viscoelasticity applied to polymers and extended to nonlinear behavior of fibers and nonlinear rheological behavior of polymers with application to extrusion and fiber spinning.

TEXT 403—FIBER PROCESSING III—3 cr. (2 and 3)
The concepts of current fiber processing machines, techniques, practices, and their validity are investigated. Student group and individual problems are assigned that require use of acquired knowledge, textile testing equipment, and processing machines. Study and examination of the cause and effect relations of fibrous material properties and processing dynamics on the fiber assemblies produced. *Prerequisite:* Text 301, 302.

Text 404—Fiber Processing IV—3 cr. (2 and 3)
Continuation of Text 403 with respect to the various fiber assemblies and yarn structures encountered in the fiber processing systems. Emphasis is placed on the machines and their fiber assemblies. *Prerequisite:* Text 301, 302, 403.

Text 411—Fabric Development III—3 cr. (2 and 3)
A study of specifications and loom details for the production of fabrics woven to the customer's order to include multicolor layouts. Warp and filling preparation are covered as well as size formulations and their methods of application. Warping and dressing plans are developed for warper and the slasher. *Prerequisite:* Text 312.

Text 412—Fabric Development IV—3 cr. (2 and 3)
A study of factors that a designer or fabric developer must consider in making of new fabrics or designs. Factors and how they control the construction of cloth, blending of natural and synthetic fibers and the functional use they impart to fabrics, Worth Street rules to govern the selling and buying of cloth, cloth order and loom assignment problems, and analysis of woven fabrics to obtain necessary construction details. Students produce a fancy fabric in the laboratory. *Prerequisite:* Text 411.

Text 413—Fabric Development V—3 cr. (2 and 3)
Designing and development of fabrics from the leno mechanism, the Jacquard head motion, and the plush loom including tufting and weaving techniques for carpets. Each student will develop an original Jacquard design, prepare and punch cards, and produce the fabric.

Text 414—Nonwoven and Knitted Structures—3 cr. (3 and 0)
A survey of nonwoven and knitted structures dealing with the principles and mechanisms involved. Various systems are covered with emphasis on yarn requirements and fabric properties.

Text 421—Textile Costing I—3 cr. (2 and 3)
Actual and standard cost principles as they apply to the manufacture of textiles. Allocating the cost of material, labor and overhead; determining the cost of individual yarns and fabrics; valuing the inventory; making of cost reports, payroll analysis and the use of data processing. *Prerequisite:* Acct 201, Senior standing, or permission of instructor.

Text 426—Instrumentation—3 cr. (3 and 0)
The principles of industrial and process instrumentation and process control. Static and dynamic characteristics of measurement devices. Transducer techniques for measurement of physical properties such as pressure, temperature, flow, weight, etc. Principles of process controllers.

Text 428—Textile Research—0-3 cr.
An original investigation of a problem in textile, fiber, or polymer science under the direct supervision of a faculty member. After completing his experimental work, the student prepares a formal, written report which he defends before the textile faculty. *Prerequisite:* Senior standing or permission of instructor.

Text 429—Textile Research—0-3 cr.
Same as Text 428.

Text 440—Color Science—3 cr. (2 and 3)
The application of the science of color to industrial practice in textiles, plastics, paints, lighting, and ceramics. The laboratory work will be performed on modern instruments and computers.

Text 460—Textile Processes—3 cr. (3 and 0)
Survey of machinery and processes of textile manufacturing from fiber formation through fabric finishing. (For students with a nontextile background.)

Text 475—Textile Marketing—3 cr. (3 and 0)
An examination of the activities involved in the distribution of textile products in today's market. Emphasis will be placed on the role of consumer research and the analysis of fashion in the design and promotion of textile products.

Text 601—Polymer and Fiber Mechanics—3 cr. (3 and 0)

Text 603—Fiber Processing III—3 cr. (2 and 3)

Text 604—Fiber Processing IV—3 cr. (2 and 3)

Text 611—Fabric Development III—3 cr. (2 and 3)

Text 612—Fabric Development IV—3 cr. (2 and 3)

Text 621—Fiber Science—3 cr. (2 and 3)

Text 622—Properties of Textile Structures—3 cr. (2 and 3)

Text 626—Instrumentation—3 cr. (3 and 0)

Text 640—Color Science—3 cr. (2 and 3)

Text 660—Textile Processes—3 cr. (3 and 0)

Text 821—Fiber Physics I—3 cr. (3 and 0)

Text 822—Fiber Physics II—3 cr. (3 and 0)

Text 830—Textile Physics—3 cr. (3 and 0)

Text 835—Textile Structures I—3 cr. (3 and 0)

Text 836—Textile Structures II—3 cr. (3 and 0)

Text 837—Composite Structures—3 cr. (3 and 0)

Text 840—Spectrophotometry—3 cr. (3 and 0)

Text 866—Fiber Formation—3 cr. (3 and 0)

Text 870—Advances in Textile Manufacturing—3 cr. (3 and 0)

Text 880—Selected Topics—3 cr. (3 and 0)

Text 891—Research—Credit to be arranged.

VISUAL STUDIES

Professors: H. N. Cooledge, Jr., R. H. Hunter

Associate Professors: J. T. Acorn, R. D. England, T. E. McPeak, *Head;* I. G. Regnier,* S. Wang

Instructor: T. G. Turner

Vis 203—Visual Arts Studio—3 cr. (1 and 6)

Studio work in visual elements and their organization; form, line, texture, space, light and color. Principles of design and formal organization of visual arts. *Prerequisite:* Permission of instructor.

Vis 205—Beginning Drawing—3 cr. (1 and 6)

Studio work in drawing and related media. *Prerequisite:* Vis 203 or permission of instructor.

Vis 207—Beginning Painting—3 cr. (1 and 6)

Studio work in painting and related media. *Prerequisite:* Vis 203 or permission of instructor.

Vis 209—Beginning Sculpture—3 cr. (1 and 6)

Studio work in sculpture and related media. *Prerequisite:* Vis 203 or permission of instructor.

Vis 211—Beginning Printmaking—3 cr. (1 and 6)

Studio work in lithography, silk screen, wood cuts, and graphics and related media. *Prerequisite:* Vis 203 or permission of instructor

Vis 213—Beginning Photography—3 cr. (1 and 6)

Studio work in photography and related media. *Prerequisite:* Vis 203 or permission of instructor.

Vis 215—Graphic Design I—3 cr. (1 and 6)

Study and studio work with historical, contemporary and experimental letter forms. Emphasis is placed on the application of letter design components to convey visual images and ideas beyond normal word and sentence formulation. *Prerequisite:* Vis 203 or permission of instructor.

Vis 217—Beginning Ceramics—3 cr. (1 and 6)

Applied studio work in ceramic hand building and pottery; creative experience in process of forming, decorating, glazing, and firing. *Prerequisite:* Vis 203 or permission of instructor.

Vis 305—Drawing—3 cr. (1 and 6)

Studio work in drawing and related material. *Prerequisite:* Vis 205.

Vis 306—Drawing—3 cr. (1 and 6)

Continuation of Vis 305. *Prerequisite:* Vis 305.

Vis 307—Painting—3 cr. (1 and 6)

Studio work in painting and related media. *Prerequisite:* Vis 207.

Vis 308—Painting—3 cr. (1 and 6)

Continuation of Vis 307. *Prerequisite:* Vis 307.

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* On leave.

Vis 309—Sculpture—3 cr. (1 and 6)
Studio work in sculpture and related media. *Prerequisite:* Vis 209.

Vis 310—Sculpture—3 cr. (1 and 6)
Continuation of Vis 309. *Prerequisite:* Vis 309.

Vis 311—Printmaking—3 cr. (1 and 6)
Studio work in lithography, silk screen, etching, wood cuts and related media. *Prerequisite:* Vis 211.

Vis 312—Printmaking—3 cr. (1 and 6)
Continuation of Vis 311. *Prerequisite:* Vis 311.

Vis 313—Photography—3 cr. (1 and 6)
Studio work in still photography and related media. *Prerequisite:* Vis 213.

Vis 314—Photography—3 cr. (1 and 6)
Continuation of Vis 303. *Prerequisite:* Vis 313.

Vis 315—Graphic Design II—3 cr. (1 and 6)
Study and studio work in layout, composition, illustration, investigation of studio skills; terminology and theories of layout and composition; emphasis on the different graphic formats and their use in advertising art. *Prerequisite:* Vis 215 or permission of instructor.

Vis 316—Graphic Design III—3 cr. (1 and 6)
Study and studio experimentation of original design layout compositions, utilizing specific techniques and graphic process in offset, gravure, and letterpress printing. *Prerequisite:* Vis 315 or permission of instructor.

Vis 317—Ceramic Arts II—3 cr. (1 and 6)
Continuation of Vis 217.

Vis 318—Ceramic Art III—3 cr. (1 and 6)
Continuation of Vis 317.

Vis 405—Drawing—3 cr. (0 and 9)
Studio work in advanced drawing and related media. *Prerequisite:* Vis 306 or permission of instructor.

Vis 406—Drawing—3 cr. (0 and 9)
Continuation of Vis 405. *Prerequisite:* Vis 405.

Vis 407—Painting—3 cr. (0 and 9)
Studio work in advanced painting and related media. *Prerequisite:* Vis 308 or permission of instructor.

Vis 408—Painting—3 cr. (0 and 9)
Continuation of Vis 407. *Prerequisite:* Vis 407.

Vis 409—Sculpture—3 cr. (0 and 9)
Advanced studio work in sculpture and related media. *Prerequisite:* Vis 310.

Vis 410—Sculpture—3 cr. (0 and 9)
Continuation of Vis 409. *Prerequisite:* Vis 409.

Vis 411—Printmaking—3 cr. (0 and 9)
Advanced studio in Printmaking and related media. *Prerequisite:* Vis 312.

Vis 412—Printmaking—3 cr. (0 and 9)
Continuation of Vis 411. *Prerequisite:* Vis 411.

Vis 413—Photography—3 cr. (0 and 9)
Advanced studio work in photography. *Prerequisite:* Vis 314.

Vis 414—Photography—3 cr. (0 and 9)
Continuation of Vis 413. *Prerequisite:* Vis 413.

Vis 415—Graphic Design IV—3 cr. (0 and 9)
Utilization of graphic, scenic and other visual design requirements for motion picture and television. Emphasis on imagination and use of visual design in relation to media and function: entertainment, documentary, institutional or advertising. *Prerequisite:* Vis 316 or permission of instructor.

Vis 416—Graphic Design V—3 cr. (0 and 9)
Advanced study and studio investigation as it applies to specific areas of advertising art, book illustration, fashion, or institutional illustration. *Prerequisite:* Vis 415 or permission of instructor.

Vis 417—Advanced Ceramic Arts—3 cr. (0 and 9)
Advanced applied studio work in ceramic sculpture and pottery. *Prerequisite:* Vis 318.

Vis 418—Advanced Ceramic Arts—3 cr. (0 and 9)
Continuation of Vis 417. *Prerequisite:* Vis 417.

Vis 419—Graphic Design VI—3 cr. (0 and 9)
Study and studio usage of design forms (typography, photography, and illustration) in the development of corporate identification for total advertising programs. *Prerequisite:* Vis 416 or permission of instructor.

Vis 420—Graphic Design VII—3 cr. (0 and 9)
Study and development of original design and advanced study into the graphic aspects for packaging, containers, and related materials in industry. Emphasis on original ideas and unique approaches to specific problems in packaging and graphics. *Prerequisite:* Vis 419 or permission of instructor.

Vis 421—Graphic Design—Studio Seminar—3 cr. (0 and 9)
Experiences related to design studio, agency, or companies involving design responsibilities and procedures in an area related to the student's particular interests. *Prerequisite:* Permission of instructor.

Vis 605—Drawing—3 cr. (0 and 9)

Vis 606—Drawing—3 cr. (0 and 9)

Vis 607—Painting—3 cr. (0 and 9)

Vis 608—Painting—3 cr. (0 and 9)

Vis 609—Sculpture—3 cr. (0 and 9)

Vis 610—Sculpture—3 cr. (0 and 9)

Vis 611—Printmaking—3 cr. (0 and 9)

Vis 612—Printmaking—3 cr. (0 and 9)

Vis 613—Photography—3 cr. (0 and 9)

VIS 614—PHOTOGRAPHY—3 cr. (0 and 9)

VIS 615—GRAPHIC DESIGN IV—3 cr. (0 and 9)

VIS 616—GRAPHIC DESIGN V—3 cr. (0 and 9)

VIS 617—ADVANCED CERAMIC ARTS—3 cr. (0 and 9)

VIS 618—ADVANCED CERAMIC ARTS—3 cr. (0 and 9)

VIS 619—GRAPHIC DESIGN VI—3 cr. (0 and 9)

VIS 620—GRAPHIC DESIGN VII—3 cr. (0 and 9)

VIS 621—GRAPHIC DESIGN—STUDIO SEMINAR—3 cr. (0 and 9)

WATER RESOURCES ENGINEERING

Professor: L. G. RICH, *Program Director*

WRE 450—WATER RESOURCES ENGINEERING—3 cr. (3 and 0)

This course covers currently important topics in the water resources engineering area. Included is a consideration of the objectives and uses of water resources and how these have evolved over time. Emphasized are the comprehensive and systems aspects of water resources development. An introduction to the use of mathematical modeling and optimization in water resources planning and management is provided. *Prerequisite:* EM 320, E&CE 330.

WRE 460—PHYSICAL OCEANOGRAPHY—3 cr. (3 and 0)

An integrated treatment of the fluid dynamic, ecologic, geologic, and resource aspects of physical oceanography. The basic principles of the physical aspects of the oceans are presented together with techniques for the application of these fundamentals. Primary emphasis is placed on relating the oceanographic phenomena to relevant problems in the marine environment. *Prerequisite:* Ch 102, Phys 222, and permission of instructor.

WRE 461—OCEANOGRAPHICAL ENGINEERING—3 cr. (3 and 0)

An integrated coverage of various facets of coastal and ocean engineering. Emphasis is placed on introducing the student to selected areas of oceanographical engineering and indicating the basic principles and current applications in these areas. Although the course is engineering oriented, the interaction of the engineer and the marine environment is included where applicable. *Prerequisite:* EM 320.

WRE 650—WATER RESOURCES ENGINEERING—3 cr. (3 and 0)

WRE 660—PHYSICAL OCEANOGRAPHY—3 cr. (3 and 0)

WRE 661—OCEANOGRAPHICAL ENGINEERING—3 cr. (3 and 0)

WRE 811—CLIMATOLOGY—3 cr. (3 and 0)

WRE 812—METEOROLOGY—3 cr. (3 and 0)

WRE 822—WATER MOVEMENT IN SOILS—3 cr. (3 and 0)

WRE 865—HYDROLOGY I—3 cr. (3 and 0)

WRE 866—HYDROLOGY II—3 cr. (3 and 0)

WRE 870—STREAM AND ESTUARINE ANALYSIS—3 cr. (3 and 0)

WRE 871—COASTAL HYDRODYNAMICS—3 cr. (3 and 0)

WRE 872—MARINE POLLUTION CONTROL—2 cr. (2 and 0)

WRE 875—RIVER BASIN PLANNING—2 cr. (2 and 0)

WRE 876—WATER RESOURCES SYSTEMS—2 cr. (2 and 0)

WRE 881—SPECIAL PROBLEMS IN WATER RESOURCES ENGINEERING—1-4 cr. (1-4 and 0)

WRE 883—SELECTED TOPICS IN WATER RESOURCES ENGINEERING—1-3 cr. (1-3 and 0)

WRE 891—RESEARCH—Credit to be arranged.

WRE 991—DOCTORAL RESEARCH—Credit to be arranged.

WILDLIFE BIOLOGY

Associate Professors: S. B. HAYS, L. G. WEBB

Assistant Professor: H. A. LOYACANO, JR.

WB 306—WILDLIFE RESOURCES OF THE SOUTHEASTERN UNITED STATES—2 cr. (2 and 0) F, S

A study of the wildlife resources of the Southeastern states, including population trends, life histories and economic importance. Conservation and proper utilization by man is emphasized.

WB 412—WILDLIFE MANAGEMENT—3 cr. (2 and 3) F, S

Basic principles and general practices of wildlife management and conservation will be covered. This course deals with the major problems concerning the management of wildlife resources, with emphasis on upland game species. The laboratory work includes practical work on the Clemson University woodlands and field trips to several areas where wildlife management is being practiced.

WB 612—WILDLIFE MANAGEMENT—3 cr. (2 and 3)

WB 809—WILDLIFE BIOLOGY SEMINAR I—1 cr. (1 and 0)

WB 810—WILDLIFE BIOLOGY SEMINAR II—1 cr. (1 and 0)

WB 815—PRINCIPLES OF WILDLIFE BIOLOGY—3 cr. (2 and 3)

WB 816—APPLIED WILDLIFE BIOLOGY—3 cr. (2 and 3)

WB 863—SPECIAL PROBLEMS—1-6 cr.

WB 891—RESEARCH—1-6 cr.

ZOOLOGY

(See also Biology)

Professors: R. K. Guthrie, *Acting Head;* E. W. King

Associate Professors: G. W. Anderson, A. S. Tombes, W. K. Willard

Assistant Professors: W. E. Bachop, E. D. Brodie, S. A. Gauthreaux, Ruth L. Hays, B. R. Ingram, R. F. Walker

Zool 100—The Biology of Human Survival—1 cr. (1 and 0)
A biological overview of those aspects of contemporary life which constitute threats to the individual and the social welfare of man now and in the future: rampant reproduction, venereal disease, illegitimacy, sterility, crowding, famine, death control, genetic engineering, and hallucinogenic drugs.

Zool 102—Principles of Zoology—2 cr. (2 and 0) F, S, SS
The application of biological principles to animals as exemplified by the structures and functions of invertebrates and vertebrates. Followed by a survey of the animal kingdom.

Zool 104—Laboratory Exercises in Zoology—1 cr. (0 and 2) F, S, SS
Demonstrations and experiments to illustrate the structures and functions of animals considered in Zool 102.

Zool 201—Invertebrate Zoology—4 cr. (3 and 3)
A survey of the phyla of invertebrate animals, including their taxonomy, morphology, development, and evolution. *Prerequisite:* Biol 101.

Zool 202—Vertebrate Zoology—4 cr. (3 and 3)
A study of vertebrates with an emphasis on systematic relationships and evolutionary advances. Laboratory will be concerned with basic morphological traits of each group as well as the ecology, life history, and identification of local forms. *Prerequisite:* Biol 101.

Zool 301—Comparative Vertebrate Anatomy—3 cr. (2 and 3) F, S
Advanced training in zoological principles, physiology, and comparative vertebrate anatomy. *Prerequisite:* Zool 102, 104.

Zool 302—Vertebrate Embryology—3 cr. (2 and 3) F, S
Fundamentals of developmental anatomy of the organ systems as illustrated by the chick and pig. Students prepare histological sections and mounts to acquire practice in laboratory procedures and knowledge of vertebrate microscopic anatomy. Identification of the various tissues is stressed. *Prerequisite:* Zool 102, 104.

Zool H302—Vetebrate Embryology—3 cr. (2 and 3) F, S, SS
Honors option for Zool 302; admission by special arrangement.

Zool 307—Animal Anatomy and Physiology—3 cr. (2 and 3) F
Anatomy, and physiological processes of ingestion, secretion, excretion, respiration, circulation, reproduction, and metabolism of warm-blooded animals. This course is designed for students majoring in Pre-medicine, Pre-veterinary, Medical Technology, Animal Science, Dairy Science, and Poultry Science. *Prerequisite:* Biol 101.

ZOOL 310—EVOLUTION—2 cr. (2 and 0)

An introduction to the fundamentals of evolutionary concepts including historical and contemporary aspects. *Prerequisite:* Biol 101.

ZOOL 403—PROTOZOOLOGY—3 cr. (2 and 3)

Taxonomy of the subkingdom protozoa with special reference to the parasitic forms directly affecting man. Representative types of free-living forms are surveyed with emphasis on their morphology, physiology and distribution. *Prerequisite:* Zool 102, 104, or 201.

ZOOL H403—PROTOZOOLOGY—3 cr. (2 and 3)

Honors option for Zool 403; admission by special arrangement.

ZOOL 404—ANIMAL PATHOLOGY—3 cr. (2 and 3) S

Designed to inform students in the causes, treatments, and prevention of animal diseases. Those transmissible to man are considered in detail. Emphasis is placed on hygiene and care of the sick.

ZOOL 405—ANIMAL HISTOLOGY—3 cr. (2 and 3) F

Microscopic structures of tissues and organs of the animal body. This course is for students in Pre-veterinary, Pre-medicine and the Animal Science courses. *Prerequisite:* Biol 101.

ZOOL 408—PHYSIOLOGY AND DEVELOPMENT OF INVERTEBRATES—3 cr. (2 and 3)

A study of the developmental and functional characteristics of invertebrates.

ZOOL 410—LIMNOLOGY—3 cr. (2 and 3)

This course is designed to familiarize the student with interrelationships between fresh-water organisms and their abiotic environment. *Prerequisite:* Biol 101, Zool 411, General Chemistry.

ZOOL H410—LIMNOLOGY—3 cr. (2 and 3)

Honors option for Zool 410; admission by special arrangement.

ZOOL 411—ANIMAL ECOLOGY—3 cr. (2 and 3)

A fundamental approach to basic ecological principles underlying the interrelationships of organisms with their abiotic environment. A variety of aquatic and terrestrial ecosystems will be studied both in the field and in the laboratory.

ZOOL H411—ANIMAL ECOLOGY—3 cr. (2 and 3)

Honors option for Zool 411; admission by special arrangement.

ZOOL 456—PARASITOLOGY—3 cr. (2 and 3)

An introduction to the phenomenon of parasitism in the animal kingdom with emphasis on basic principles. Classical and experimental approaches to the study of parasitism are examined in reference to the protozoa, helminths and arthropods.

ZOOL H456—PARASITOLOGY—3 cr. (2 and 3)

Honors option for Zool 456; admission by special arrangement.

ZOOL 458—CELL PHYSIOLOGY—3 cr. (2 and 3)

An introduction to the fundamental processes of physiology as exemplified by the cell. Dynamic cellular environment, organelles, respiration, metabolism, protein synthesis, and basic thermodynamics as it applies to the cell, will be covered. Laboratory will include an introduction to techniques in study of cellular physiology. *Prerequisite:* Organic Chemistry, Biol 101.

Zool H458—Cell Physiology—3 cr. (2 and 3)
Honors option for Zool 458; admission by special arrangement.

Zool 460—General Physiology—3 cr. (2 and 3) S
Systematic study of the physiology of nervous activity, hormonal control, neuro-hormonal interrelations, circulation, respiration, digestion, renal control, muscular activity and reproduction. Effort in the laboratory will be concentrated toward acquainting the student with methods of obtaining information about these systems. *Prerequisite:* Biol 101, General Chemistry.

Zool 461—Anatomy—3 cr. (3 and 0) F
Those aspects of anatomy related to the skeletal, circulatory, muscular, nervous, endocrine, respiratory, digestive, and excretory systems will be covered. Emphasis will be placed on gross anatomy with some work in microanatomy. *Prerequisite:* Biol 101.

Zool 462—Herpetology—3 cr. (2 and 3)
Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families and U.S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology or permission of instructor.

Zool 463—Ichthyology—3 cr. (2 and 3)
Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U.S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Vertebrate Zoology or permission of instructor.

Zool 464—Mammalogy—3 cr. (2 and 3)
Origin, evolution, distribution, structure, and function of mammals, with laboratory emphasis on the mammals of South Carolina. Field collection required. *Prerequisite:* Vertebrate zoology or permission of instructor.

Zool 465—Ornithology—3 cr. (2 and 3)
The identification, life history and ecology of birds. Field trips, work with bird specimens and correlated reading will give the student a working knowledge of at least 100 species of the common birds.

Zool 470—Animal Ethology—3 cr. (2 and 3)
Classical and current concepts and controversies regarding animal behavior; individual and social behavioral patterns. *Prerequisite:* Vertebrate Zoology or consent of instructor.

Zool 475—General Endocrinology—3 cr. (2 and 3)
This course is an introduction to the basic principles of chemical integration via hormones found throughout the animal kingdom. Morphology and function of various endocrine tissues, hormone chemistry and modes of action will receive major consideration.

Zool 491—Special Problems in Zoology—2 cr. (0 and 6)
Research problems in selected biological disciplines to provide initiation to research planning and techniques for biological science majors. *Prerequisite:* Senior standing and permission of the appropriate section chairman.

ZOOL 602—VERTEBRATE EMBRYOLOGY—3 cr. (2 and 3)

ZOOL 603—PROTOZOOLOGY—3 cr. (2 and 3)

ZOOL 604—ANIMAL PATHOLOGY—3 cr. (2 and 3)

ZOOL 605—ANIMAL HISTOLOGY—3 cr. (2 and 3)

ZOOL 608—PHYSIOLOGY AND DEVELOPMENT OF INVERTEBRATES—3 cr. (2 and 3)

ZOOL 610—LIMNOLOGY—3 cr. (2 and 3)

ZOOL 611—ANIMAL ECOLOGY—3 cr. (2 and 3)

ZOOL 656—PARASITOLOGY—3 cr. (2 and 3)

ZOOL 658—CELL PHYSIOLOGY—3 cr. (2 and 3)

ZOOL 660—GENERAL PHYSIOLOGY—3 cr. (2 and 3)

ZOOL 661—ANATOMY—3 cr. (3 and 0)

ZOOL 662—HERPETOLOGY—3 cr. (2 and 3)

ZOOL 663—ICHTHYOLOGY—3 cr. (2 and 3)

ZOOL 664—MAMMALOGY—3 cr. (2 and 3)

ZOOL 665—ORNITHOLOGY—3 cr. (2 and 3)

ZOOL 670—ANIMAL ETHOLOGY—3 cr. (2 and 3)

ZOOL 675—GENERAL ENDOCRINOLOGY—3 cr. (3 and 0)

ZOOL 801—ANIMAL HISTOLOGY—3 cr. (2 and 3)

ZOOL 802—HISTOLOGICAL TECHNIQUES—3 cr. (1 and 6)

ZOOL 803—POPULATION DYNAMICS—4 cr. (2 and 6)

ZOOL 804—ORNITHOLOGY—3 cr. (2 and 3)

ZOOL 805—ANIMAL PATHOLOGY—3 cr. (2 and 3)

ZOOL 806—COMPARATIVE ANIMAL PHYSIOLOGY—3 cr. (3 and 0)

ZOOL 807—USE OF RADIOISOTOPES IN BIOLOGICAL RESEARCH—3 cr. (2 and 3)

ZOOL 808—RADIOBIOLOGY—3 cr. (2 and 3)

ZOOL 809—TOXICOLOGY—3 cr. (2 and 3)

ZOOL 810—MAMMALOGY—3 cr. (2 and 3)

ZOOL 812—SEMINAR—1 cr. (1 and 0)

ZOOL 813—EVOLUTION—3 cr. (3 and 0)

ZOOL 830—HISTOCHEMISTRY-CYTOCHEMISTRY—3 cr. (2 and 3)

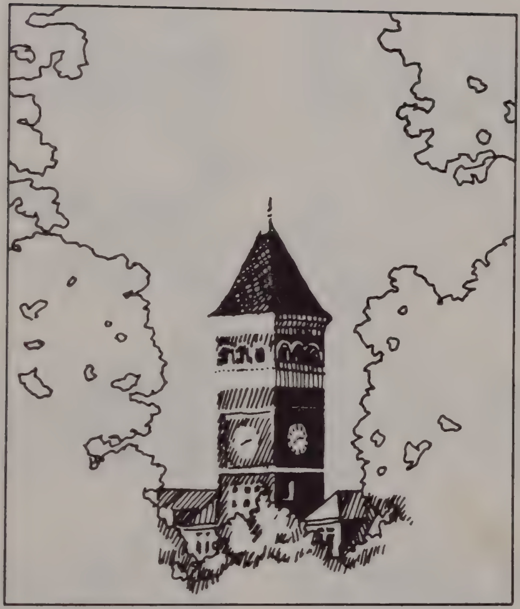
ZOOL 852—PRINCIPLES AND METHODS OF SYSTEMATIC ZOOLOGY—2 cr. (2 and 0)

ZOOL 856—ECONOMIC ZOOLOGY—3 cr. (2 and 3)

ZOOL 863—SPECIAL PROBLEMS—1-4 cr.

ZOOL 891—RESEARCH—Credit to be arranged.

ZOOL 991—DOCTORAL RESEARCH—Credit to be arranged.



PART VI

STUDENT REGISTER

GRADUATES OF 1971

ASSOCIATE AND BACHELORS' DEGREES CONFERRED MAY 7, 1971

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE

Agricultural Economics

Manuel Padgett Black, Jr.	Orangeburg
George Alfred Butler	Aynor
Marvin Gaddy Carmichael	Dillon
James Kelly Edwards	Galivants Ferry
Benjamin Howard Frye	Galivants Ferry
David Newberry Hall	Mt. Ulla, N. C.
William Huff Hammond	Greenwood
*William Guy Hildebrand	Camden
Curtis Leslie Hobbs, Jr.	Lynchburg
Frankie Rogers Myers	Seneca
Sidney Lawrence Smith	Swansea
Charles Kilmer Snoddy	Greenwood

Agronomy

William Leslie Abernathy III	Chester
*Eldon Elbert Allen, Jr.	Aynor
**Stanley Rhett Dobbins	Townville
Larry Earl Elmore	Greer
Roachel Dent King III	Society Hill
William Maksymowicz	Johnston, R. I.
Edward Charles Murdock	Monroeville, N. J.
James Wilson Polatty	Ninety Six
Andrew Luther Richardson	Johnsonville
David Burton Sease	Newberry
**John Richard Steer	Ninety Six

Animal Science

John William Ducworth	Summerton
Daniel Richard Ellison	Williamston
David Byrne Fleming	Spartanburg
***Louisa Ready Fleming	Johnston
Anna Ruth Hudgens	Mountville
Edward Michaels II	Buffalo, N. Y.
Michael O'Connell	Greenville
*Mary Jacqueline Price	Sharon
Bernard Joseph Stanek, Jr.	Hopkins
Richard Edward Wooten	Pendleton

Biology

John Richard Abel	Wayne, Pa.
*Robert Steven Bisker	Salisbury, Md.
*Greer Miller Broadwater	Ridgeway
*William Thomas Broadwater	Woodsboro, Md.
*Jane Day Chasteen	Chappels
***Perry Buckner DeLoach	Walterboro
*John Patrick Dunbar	Rock Hill
Marc Morris Feinberg	Philadelphia, Pa.
*William Herbert Fleming	Abbeville
Warren Richard Garrett, Jr.	Greenville
Glen Irwin Garris	Sumter
Robert Mario Giaimo	Washingtonville, N. Y.
Randall Parrish Griffin	Six Mile
Richard Bruce Grosvenor	Elnora, N. Y.
*Joe Selvin Harrell, Jr.	Columbia
Donald Christopher Hicks	Charleston Heights
**Deborah Davenport Hohla	Mentor, Ohio
Walter Monroe Hutchins	Spartanburg
George Tripp Jones	Loris
Thomas William Long	Saluda
Henry Singleton Moore	Georgetown
Robert Andrew Moore	Fairhaven, N. J.
George William Mozingo III	Columbia
Thomas Franklin Scurry II	Columbia
Martha Froemming Sheppard	Houston, Tex.
Jerry Wayne Spradley	Aiken
Robert James Talbert	North Augusta
*Carl Anthony Zambon	Oxon Hill, Md.

Dairy Science

Michael Louis Catto	Pauline
Howard Preston Lucas	Clemson
Charles Gerald Moore	Moore

Food Science

***Robert Lorne Shewfelt	Clemson

Horticulture

Henry Curtis Edens III	Dalzell
*Mary Lucinda Hockenberry	Slippery Rock, Pa.
*Richard Dean Wheeler	Clemson

Poultry Science

Jerel Dean Harmon	Prosperity
Ira Hubert Kinard, Jr.	Prosperity
Benjamin Robert Lybrand	Swansea

COLLEGE OF ARCHITECTURE

BACHELOR OF ARTS

Pre-Architecture

Verne Cassaday ---------------- Greenwood
*Ronald William Djuren -------------------- Prospect Park, N. J.
William Francis Donaldson, Jr. ------------------------- Annapolis, Md.
*Lewis Mobley Ficken ------- North Augusta
Stanley Dean Gailey -------------------- Iva
William Henry Hayden III ---- Myrtle Beach
*Rodger Ferguson Hinton ---------- Pickens
Paul Hughes, Jr. -------------------- Cayce
*George Booker Jennings III -- Roanoke, Va.
Donald Raymond Lindsey -- Bay Minette, Ala.
Robert Gene McCleskey --------- Greenville
Donald Masucci -------------- Neptune, N. J.
Anthony Glenn Moore ------- Moncks Corner
Brooks Robinson Prince III ------ Greenville
Paul Ervin Reavis, Jr. -- Winston-Salem, N. C.
Stephen Andrew Russell -- Indianapolis, Ind.
Steven Allan Sandberg ---- Jamestown, N. Y.
*Frank Wilson Spencer III --- Savannah, Ga.
**Tad Allan Stanley ------ Montgomery, Ala.
John Thomas Suber, Jr. ----------- Columbia

BACHELOR OF SCIENCE

Building Construction

James Patrick Burnette -- Heber Springs, Ark.
*Stephen Chando, Jr. ------- Bethlehem, Pa.
Daniel Joseph Cosbey ---- Falls Church, Va.
Charles Hydrick Dewitt ------- St. Matthews
William John Frederick ----- St. James, N. Y.
Judson Alan Kraft ------ Miami Springs, Fla.
*Steven Howard Mull ------------- Florence
Larry Don Sherman --------------- Piedmont
Stephen Franklin Smoak ---------- Rock Hill
Don Vance Whelchel -------------- Gaffney

BACHELOR OF ARCHITECTURE

Aubrey Dale Ayers --- Pompano Beach, Fla.
William Stephen Carson ---------- Columbia
Ben Giles Compton ---------------- Lexington
William Randolph Cunningham --------------------- Waynesville, N. C.
David Sullivan Glymph --- Silver Spring, Md.
Robert Hudson Goodson, Jr. ------ Hartsville
Daniel Cassel Herr ---------- Pittsburgh, Pa.
Raymond Thaddeus Huff -------- Charleston
*Richard Henry Francis Kapp --- Greenville
Edward Thomas Kinghorn ------- Greenville
Barry Robert Koretz -------- Brockton, Mass.
*Ralph Dixon Lamar, Jr. ------------ Easley
Leslie Michael Lawlor ---- Newburgh, N. Y.
Michael Theodore McCoy ------ Myrtle Beach
Gary Vaughn Magarian ------ Orlando, Fla.
*John Milton Miller -------------- Greenville
*John William Morgan III -------- Columbia
Anne Caroline Morris ------------ Columbia
Matthew Michael Mossman ------------------------ Cincinnati, Ohio
Richard Herman Schroeder ---------------------- Hightstown, N. J.
*William Daniel Shelley ------------- Latta
*Ronald Stephen Tillotson ---------------- Colorado Springs, Colo.
Lonnie Durell Watt, Jr. ------------ Anderson
Killough Henry White III ---------- Chester
**Craig Caldwell Wrigley -------- Columbia

COLLEGE OF EDUCATION

BACHELOR OF ARTS

Elementary Education

Keri Ann Bolding ----------------- Lyman
Donna Marie Brooks ---------------- Loris
Rebecca Audrey Davis ------------- Sumter
**Patricia Shea Day ------------ Greenville
***Mary Morgan Greene --------- Anderson
**Ruth Jane Greer ------------- Westminster
Alecia Ann Haddon --------------- Donalds
Alice Marie Haddon --------------- Donalds
Pamela Jill Hyatt -------------- Wayne, Pa.
Peggy Elaine Lee ------------- Westminster
Kathryn Anne McCormick -------- Columbia
Nancy Jo Mobley -------------- Orangeburg
*Georgia Ann Pender ------- Arlington, Va.
Susan Callison Pinckney -------- Greenwood
Ernest Gary Rice -------------- Ware Shoals
Nancy Jean Sliker ------------ Wayne, N. J.
Mary Susan Stein ---------------- Anderson
Sherrill Louise Watson ----------- Edgefield

Secondary Education

Harley Gervis Babb III	Moore
Beverly Frances Baker	Summerville
**Brenda Kaye Cash	Pickens
***Daniel Earl Cobb	Easley
David Luther Coleman	Summerton
*Sharon Proctor Crout	Forest City, N. C.
James Elliott DeLoache	Easley
George Marion Ducworth	Anderson
Gwin Hunter Forrester	Clemson
*Sandra Anne Gentry	Anderson
Alexandra Georgeo	Mt. Pleasant
David Fogg Hall, Jr.	Pennsville, N. J.
**Martha Frances Hall	Fulton, Miss.
Ethel Joanne Hawkins	Central
Gerald Edward Hiles	Easley
*Sandra Alicia Holden	Clemson
*Robert McCollum Johnson	York
Martha Lillian Kahler	Kershaw
Ian Bradley Kamen	Baldwin, N. Y.
*Lynn Rogers King	Piedmont
Margaret Norma Kirkland	Bamberg
**Linda Ann Koczan	Edison, N. J.
Michael Edward McNeill	Ware Shoals
*Elaine Owens Martin	Easley
Mary Van Blaricom Means	Clemson
David Hood Mitchell, Jr.	Hickory Grove
Barbara Ann Mostertz	Greenville
Robert Matthew Parker, Jr.	South Belmar, N. J.
Deborah Jo Patton	Charleston
**David Leslie Pearce	Anderson
*Mary Hill Peddicord	Williamston
Raymond Shafter Pilgrim, Jr.	Marietta, Ga.
***Nancy Rebecca Singleton Rochester	Seneca
*Elizabeth Roper	Laurens
Frederick Joseph Schilling III	Old Westbury, N. Y.
*Nancy Faye Simmons	Pickens
Paul Terry Stone	Manning
**Cynthia Diane Strickland	Anderson
Kenneth Elizabeth Simmons Thompson	Greenwood
Teresa Carlene Thompson	Greenville
Mary Jane Trotter	Columbia
Ronald Alan Walfield	Walterboro
William Guyton Wardlaw, Jr.	Anderson
James Emmett Whitson	Greenville

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

**William Royce Caines	Loris
Tony Ray Dempsey	Varnville
Eben Dudley Godbold	Florence
*Gene Eldred Hardee	Loris
Phillip Wayne Malphrus	Ridgeland
Carlon Levon Martin	Aynor
Ronald Irby Ouzts	Callison
Joseph Howard Porter	Loris
*James Washington Preacher	Ruffin
Jack Boling Reynolds, Jr.	Columbia
Francis Marion Smith	Estill
Roger Dennis Smith	Jefferson
*Kenneth Gowan Southerlin	Travelers Rest
*William Timmerman Wall	Edgefield
John Fred Williams	Cleveland, N. C.

Industrial Education

Norman McSwain Cason	Abbeville
Jerry Bernard Green	Graniteville
Dexter Groves Jeter II	Ware Shoals
Lewis Albert Jordan	Myrtle Beach
James Patrick Kelsey	Pickens
Anthony Edwin McClure	Johnson City, Tenn.
James Allen McCullough	Anderson
Benjamin Robert Meggs ,Jr.	Florence
Ronald Wayne Newton	Clemson
William Schlupp, Jr.	Cinnaminson, N. J.
*James Broadus Taylor, Jr.	Greenville
Louis Ervin Taylor	Great Falls
Peter Frederick Weddell	Goshen, Ind.
Lynn Charles Welborn	Pickens
John Henry Wessinger	Columbia
Raymond Andrew Yauger	Uniontown, Pa.

Science Teaching

*Eloise Joyce Albrecht	Isle of Palms
Ronnie Wayne Fowler	Williamston
John Neely Ross	Washington, D. C.
Charles Dukes Scott	Orangeburg
Martha Ann Seay	Spartanburg

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

James Warren Garthe	Dover, N. J.
Joseph Alton Rinehart	Batesburg
Lee Arlington Warner	Pickens

Ceramic Engineering

*Walter Peter Belouin, Jr. ------------ Union
Collins Arthur Burbage -------- Summerville
William Carlos Gruber -------- Goose Creek
Donald Ray Handy ------------------ Aiken
John Charles Lindsay, Jr. ---- Bennettsville
William Weaver Presson, Jr. -- Monroe, N. C.
*Lynn Brian Starling --------- Lakeland, Fla.
*Davis Camp Walker ---------- Decatur, Ga.

Chemical Engineering

Charles David Allen ---------- Bennettsville
Leslie Reade Baxley ------------- Columbia
David Eugene Bowen ------------------ Iva
**Robert Leslie Bracey ---------- Darlington
Alan McKenzie Campbell -- Washington, D. C.
William Malcolm Carsten -- Jacksonville, Fla.
Francis Siu Hung Chan
------------------ Kowloon, Hong Kong
*Douglas Farrell Clements ---------- Lamar
*Thomas Glenn Doss ---- Wapakoneta, Ohio
*Charles Henry DuPre, Jr. ----- Spartanburg
John Michael Haas -------------- Charleston
*Leon Carroll Harmon ----------- Lexington
Michael Lee Horton -------------- Kingstree
John Wilson Laney III -------- Bennettsville
*James David Liskey ---- Harrisonburg, Va.
Jerry Lee Lollis --------------- Ware Shoals
***Paul Wilson Mims, Jr. -------- Columbia
*Joseph Daniel Pool --------------- Easley
*Bruce David Roberts ------------- Taylors
*William Michael Shirley ------ Honea Path
James Wenford Taylor, Jr. -------- Greenville
*Robert Lester Thomas ---------- St. George
***Douglas Waters VanOsdell --- Summerton
Andreas Westergaard III ------- Charleston

Civil Engineering

Timothy James Amick ----------- Columbia
Dennis Edward Arrington ------- Charleston
Frank Stanford Bland, Jr. --------- Edgefield
*Charles Leslie Bopp, Jr. ---- Roxboro, N. C.
Arnold Alvin Brannen ---------- Great Falls
*Ronald Lee Bridwell ------------ Greenville
John Leslie Chambers ------------- Fort Mill
Don Michael Cribb ------------- Walterboro
Joseph Edward Crook ---- Charleston Heights
Jerry Glenn DeLaughter ---------- Edgefield
John Porteous DeVeaux ---- Sullivans Island
William Acker Dunn, Jr. ----------- Donalds
**Ronald Warren Eck ----- Kenilworth, N. J.
Dan Lee Freeman --------------- Anderson
John David Griffith -------------- Barnwell
Alton Lester Harvey --- Deerfield Beach, Fla.
William Ronald Irick --------- Orangeburg
Joe Kenneth Jones, Jr. ----------- Greenville
*Nicholas Kelaidis ---------- Athens, Greece
*David Michael Koss ------- Amawalk, N. Y.
*James Austin Lee --------------- Pendleton
*Thomas Joseph McArdle, Jr. ---- Greenville
*James Earle McCoy ------------ Greenville
Howard Lee McCullough ----------- Clemson
*John Michael McTamney III -- Trenton, N. J.
*Marvin Eugene Nettles ---------- Ridgeland
Robert Edgar Perry III ------ Brunswick, Ga.
Charles Edwin Rivers -------- Thomson, Ga.
John Daingerfield Roeser --- Wallingford, Pa.
Phillip James Rowell ------------- Columbia
**Wayne Bryan Smith ---------- Greenwood
Henry Floyd Weathers, Jr. ---- Fountain Inn
Richard Brantley Werts ---------- Ninety Six
*Forrest Monroe Whittington ---------- Loris
Grady Daniel Wicker ------------ Newberry
Terry Eugene Williams ---------- Greenville
**Janice Elizabeth Wilson -- Four Oaks, N. C.

Electrical and Computer Engineering

*John Rodgers Allen ------------- Kingstree
**Thomas Marvin Bell --------------- Lodge
Lowell Everette Belue ---------------- Union
Ronald Patrick Berry ------------ Belvedere
*William Norris Breedlove, Jr. -- Mt. Pleasant
Rodger Eugene Brown ------- Jamaica, N. Y.
Duncan Kenyon Burns ---------- Charleston
*Walter Timmons Cardwell, Jr. ---- Anderson
*James Wayne Cox -------------- Abbeville
*David Lee Garrison ------------- Rock Hill
Gary James Greer ----------------- Taylors
August Erwin Heins, Jr. ---------- Charleston
John Wesley Hollister III --- Jacksonville, Fla.
*Lonnie Richard Hyatt ------------- Pauline
Melvin Curtis Johnston ------------ Denmark
***John Boyce Jones ------------ Charleston
David James Lank ---------- Salisbury, Md.
**Barry Gray Mattox ------------ Columbia
Robert Thurlow Morris II ---- Baltimore, Md.
*Teddy Morris, Jr. -------------- Greenwood
Randolph Morgan Moyer ------------ Sumter
Larry Vincent Parker ------------- Wellford
William Sanders Parnell ------ Calhoun Falls
Wendel Paul Potts ------------------ Aynor
**Mark Allen Reynolds ---- Asheville, N. C.
*James Lafayette Rimer III ---- Spartanburg
John Drummond Snoddy, Jr. ----- Greenville
**Michael Knudson Stenstrom
----------------- Hendersonville, N. C.

Engineering Analysis

Richard Vance Landrum ---- North Charleston
Larry Vernon Wise ---- Columbia

Mechanical Engineering

Jeffrey Edward Brooks ---- Wilmington, Del.
Herbert Warren Brown, Jr. ---- Easley
William Howard Coleman ---- Townville
Jerry Lynn Cooper ---- Rock Hill
Benjamin Lamont Dawkins ---- Greenville
Kenneth Walter Detwiler ---- Columbia
*Lawrence William Dickenson ---- Belvedere
John Reuben Floyd, Jr. ---- Newberry
Steven James Harrower ---- Asheville, N. C.
*Christopher Charles Hill ---- Roebuck
Hollen Lewis Hoffman ---- Greenville
Frank Darrell Howell ---- Greer
**Harold Senn James ---- Union
Dodge Putman Lewis ---- Clemson
**William Robinson McCleave, Jr. ---- Rock Hill
George Kennedy Milam ---- Sandy Springs
Dennis Paul Patrick ---- Pacolet Mills
Thomas Bryant Pettit III ---- Seneca
Marion Francis Sadler, Jr. ---- Leesville
*Roger Bernard Smith ---- Mandeville, La.
Michael William Taylor ---- Aiken
Lawrence Edwin Weaver ---- Shelby, N. C.
Richard David Youtz, Jr. ---- Lebanon, Pa.

Metallurgical Engineering

John Michael Grochowski ---- Philadelphia, Pa.

COLLEGE OF FOREST AND RECREATION RESOURCES

BACHELOR OF SCIENCE

Forestry

James Henry Bass, Jr. ---- Camden
Edward Michael Belken ---- Fort Walton Beach, Fla.
Charles Roger Birch ---- Spartanburg
*Richard Edward Bullock ---- Cream Ridge, N. J.
Robert Andrew Cloninger ---- Gastonia, N. C.
Thomas William Davis, Jr. ---- Columbia
Thomas Walter Haene ---- Charlotte, N. C.
Robert Arthur Harris ---- Fort Mill
Charles Blackwell McElveen ---- Florence
*Bernard Robert Ozbolt ---- Walterboro
John Dennis Page III ---- Hampton
Harry Stanton Schulze, Jr. ---- Mechanicsburg, Pa.
Charles Acker Sibley ---- Rock Hill
John Jay Stankiewicz ---- Freehold, N. J.
Richard Henry Sutherland ---- Abbeville
James David Walters, Jr. ---- Greenville
David Mark Whittaker ---- Rhinebeck, N. Y.
William Harvey Wiley II ---- Moncks Corner

Recreation and Park Administration

Richard Ashley Black ---- Chester
Randy Lee Bray ---- Clemson
Daniel Franklin Card ---- Seneca
*Bradley Dean Cary ---- Leesville
*Mary Lil Coggin ---- Charleston
*Linda Lee Dasher ---- Greenwood
Ned Mabry Eaddy ---- Lake City
*Donnie James Edgar ---- Seneca
*Nancy Kenyon Fairey ---- Latta
Charles Wilson Harrison ---- Roebuck
Richard McDuffie Hart, Jr. ---- Mauldin
John Lewis Irvin, Jr. ---- Fort Mill
Philip Wesley Jackson ---- Pendleton
Harold Mack Kennedy, Jr. ---- Columbia
Ann Elliott Kester ---- Columbia
Ronald Decker Kitchens ---- Chamblee, Ga.
Robert Philip Lawton ---- York
Charles Homer Ledford ---- Townville
Patricia Anne McCuen ---- Taylors
John Patrick Mickanis ---- Hanover, Md.
Albert Carlisle Peden, Jr. ---- Simpsonville
Thomas Lee Pence ---- Salisbury, N. C.
*Joseph Edgar Swofford ---- Laurens
Diane Elizabeth Tuttle ---- Clemson
Charles Tutan Waters ---- North Augusta

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS

Arts and Sciences

William Gibson Agnew, Jr.
---------------- Lookout Mountain, Tenn.
*George Edward Biediger -------- Greenville
Joseph Bailey Bright -------- Asheville, N. C.
Michael Edmund Butler -------- Fairfax, Va.
**Lanny Adolph Byrd ---------- Branchville
Glenn Scott Cannon ------------- Rock Hill
Robert Clement Carlton, Jr. ---- Spartanburg
Christopher Cameron Cipperly
---------------------- Washington, D. C.
James Elliott Evans, Jr. ----------- Newberry
Johnny Sherwood Everette -------- Piedmont
Bruce Hunter Gilbertson ---- Plainfield, N. J.
***Michael Joseph Gombola ------ Greenville
David LeRoy Green -------------- Lynchburg
Milton Steven Hester ------------ Greenville
Jerry Whitworth Hodge ---------- Greenville
Georgia Ellis Hunter ------------- Columbia
William Frank Kellam ------------ Anderson
David Ralph Landing ------------ Greenville
Kenneth Wayne Lanford ------ Spartanburg
James Morgan League, Jr. ------- Greenville
Kenneth Carter McNabb ---- Alexandria, Va.
Carol Lawton Maner -------------- Garnett
Allan Robert Meyerriecks ----- Myrtle Beach
William Brooks Millis ------ High Point, N. C.
Willie Harold Oglesby, Jr. -- North Charleston
**Samuel Fraser Reid, Jr. -------- Fort Motte
Robert Francis Snyder, Jr. -- North Charleston
*Algernon Gibson Solomons, Jr. ------- Estill
David Elmer Taylor ------- Asheville, N. C.
David Lincoln Thomas -------- Warren, Ohio
*Howard Denton Williamson, Jr. ---- Cheraw
**Eros Wayne Wilson ----------- Abbeville
Robert Shaw Wilson ---------------- Sumter

BACHELOR OF SCIENCE

Accounting

**Douglas William Braun ---- Leesburg, Fla.

Industrial Management

Barnett Alexander Allgood III -- Toccoa, Ga.
Samuel Walter Austin ----------- Greenville
Richard Clifton Ballenger -------- Anderson
*Edgar Lee Benjamin, Jr. -------- Mountville
Christopher Deryl Binnicker ---- Orangeburg
*Frank Martin Boggs ---- Charleston Heights
Robert Allen Bowers, Jr. --------- Greenville
Henry Clay Brooks ------- College Park, Ga.
Lewis Carroll Cameron ---------- Ninety Six
Durward Cave Cromer, Jr. ------- Blackville
Hubert Judson Dandridge III ---- Cottageville
Mario Richard Danieli ------ Lyndhurst, N. J.
Philip Gregory Degen --------------- Sumter
John Michael Demosthenes ---------- Sumter
Daniel Harris Dye --------------- Anderson
Sam Jule Enis, Jr. --------------- Charleston
Michael Eugene Evans -------- Timmonsville
Tommy Joe Fleming ------------- Greenville
Lee Matthew Flowers, Jr. -------- Hartsville
Marion Ralph Floyd --------------- Conway
*Patterson Wardlaw Foy, Jr. ---- Springfield
Jesse Henry Gaskins ----------- Chesterfield
James Rembert Greer ---------- Spartanburg
William Preston Hall ------------ Shaw AFB
John Gaines Hammond, Jr. ------ Greenwood
Richard Ellis Henkel ------ Waynesboro, Va.
Carl Edwin Henson ---------------- Seneca
Joel Marshall Hoefer -------------- Columbia
David Michael Holmes ------------ Gaffney
Charles Ray Jackson ---------------- Aiken
Milledge Anthony Johnson --- North Augusta
Larry Vernon Jordan ---------------- Belton
John Wesley Josey -------- Jacksonville, Fla.
Richard Edward Kilby ----------- Greenville
James Alton Knight, Jr. ---------- Gray Court
Gary James Laden -------- Morristown, N. J.
William Reese McCrary ----------- Florence
Richard Francis McMillan, Jr. ------ Bamberg
Walter Elwood Matthews -------- Driver, Va.
Charles Wilson Mellard, Jr. ---- Mt. Pleasant
*Thomas Arthur Messick -- West Chester, Pa.
Michael Augustine Miller ------------ Union
David Lee Mullis ----------- Gastonia, N. C.
Fred McTeer Padgett ----------- Walterboro
Robert Lee Paine II
--------------- Atlantic Highlands, N. J.
Larry Edward Porter -------------- LaFrance
Ted Nathan Ramsey ------------- Greenville
Howard Longaker Schulz, Jr.
------------------------ Vineland, N. J.
William Thomas Scott ---------------- Dillon
Donald Terry Stegall ------------- Anderson
Stephen Hoy Taylor ---------- Myrtle Beach
Larry Stephen Thompson ------ Roanoke, Va.
Joseph Jackson Turner, Jr. -------- Williston
Richard White Turner --------- Augusta, Ga.
Stephen Eason Tyson III -------- Orangeburg
Michael Leon Whitfield ----------- Anderson
*Garland Keith Wilson ------------ Fort Mill

Textile Chemistry

Thomas David Taylor ---------- Honea Path
Nelson Taylor Weaver ---------- Greenville

Textiles

Robert Alan Austin ------------ Fairfax, Va.
Samuel DeRonda Love, Jr. -- Gastonia, N. C.
**William Gaines Wilson --------- Abbeville

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS

Robert William Aines ______ Springfield, Va.
*Patricia Robertson Anderson __ Statham, Ga.
***Joanne Smith Azelkas _________ Anderson
**Julia Marguerite Bailes _______ Greenwood
*Lyla Boyd Baumann ____________ Pendleton
Robert Mark Behling ___________ Mt. Joy, Pa.
Joseph James Belknap ______ Lynbrook, N. Y.
Harold Wayne Bishop __________ Greenville
John McClellan Bond ______________ Clemson
Robert Walton Broome __________ Charleston
Gregory Robert Brown ______ Gasport, N. Y.
Harold Chandler III ________________ Sumter
*Susan Bailey Chandler ___________ Clemson
Rufus Bernard Chapman, Jr. _____ Charleston
Ronald Edmond Cooper __________ Columbia
*Robert Allen Cox ________________ Pamplico
Roger Dell Cranford ________________ Chester
Barbara Lynn Cromer ____________ Columbia
John Duffield Curtis II _____ Smithtown, N. Y.
Thomas John Cusumano _____________ Sumter
David Franklin Dansby ________ Ware Shoals
Sydney Ruth Doak ______________ Walterboro
Douglas Bruce Eason __ New Canaan, Conn.
Howard Brian Edgar ______ Plainview, N. Y.
Allen Gibson Edwards _____________ Cheraw
Wilma Jean Edwards ______________ Wellford
Dale Francis Ellenburg ___________ Anderson
Elliott Benton Eskew _______________ Clemson
Richard Hugh Foster ___ Fredericksburg, Va.
William Twyman Garrett, Jr. ________ Pelzer
Warren Thomas Givens, Jr. _________ Sumter
David Herbert Golly ______ Jacksonville, Fla.
Donald McCrae Gore ____________ Hartsville
Michael Ransom Gough ___________________ West Winfield, N. Y.
George Allen Graab, Jr. ___________ Columbia
Kenneth Dalton Grant _______________ Pickens
James Michael Griggs ____________ Hartsville
*John Francis Hanzel ____ Greensboro, N. C.
Daniel Francis Harkins ______ Claymont, Del.
Richard Ara Harpootlian ___ Charlotte, N. C.
Mary Lenoir Hartzler _______________ Camden
**Linda Elaine Hayes _______________ Taylors
Landrum Hazel Henderson, Jr. ______ Chester
*Susan Boulware Henderson _____________________ Washington, D. C.
Edward Moreton Hughes _________ Greenville
Morgan Randall Humphreys, Jr. ____ Cheraw
Amos Hykes ______________ Greencastle, Pa.
**Carolyn Elaine Jarrell ________________ Altamonte Springs, Fla.
*Linda Elkin Jennings ___________ Greenville
*Michael Lynn Johnson ______________ Aiken
Walter Jennings Johnson, Jr. ______ Columbia
Janie Pearl Jones _________________ Columbia
Billie Ann Kelly ________________ Atlanta, Ga.
Thomas Larry Kemmerlin _________ Columbia
Robert Patrick Lusk ______________ Pendleton
Virginia Rogers McMurray ___________ Clinton
Georgann Maertens ________________ Seneca
Nancy Ann Marcengill ________ Williamston
**Guy Harold Marinello __ Jewett City, Conn.
Douglas Christopher Martin ___ Marietta, Ga.
Frank Lemar Matthews ______________ Sumter
*Errol Glenn Mercer ____________ Georgetown
Robert William Michie _____ Kensington, Md.
Robert Homer Mitchell ___________ Greenville
Charles Donald O'Briant ________ McCormick
Robert Mark Ohanesian ___ Huntington, N. Y.
**Guy Laurence Osborne _____________ Union
Claude Aubrey Parks III ____ Charlotte, N. C.
Joel Dennis Parnell _______________ Anderson
LaBonney Louise Parnell ________ Charleston
George Davis Philips ________________ Sumter
James Everette Pittman, Jr. ______ Greenville
Carl Frank Pospisil _____________ Union, N. J.
James Randel Putnam _________________ Easley
Angela Witt Rainey ____________________ Starr
*Rita Jo Rampey _________________ Greenville
Mary Virginia Ridgill _________________ Sumter
Earl Kenneth Rigler, Jr. ____ Landenberg, Pa.
William Bruce Russell _______ Bethesda, Md.
Patricia Ann Saggus ______________ Edgefield
***Ludmila Alexander Savitsky ____ Clemson
*John Michael Sears ________________ Anderson
John Marshall Stith _______ Sullivans Island
*Eugene Glenn Stribling _____________ Lyman
Watson Smith Strickland, Jr. ____ Georgetown
Stephen Edward Taylor ________ Greenwood
Alexander Ur III _________________ Greenville
Thomas Charles Valesky __ Penns Grove, N. J.
Robert Lee Wiggins ___________________ Easley
***Georgia Angela Williams ________ Clemson
Marina Elisabeth Winquist __ Dedham, Mass.

SCHOOL OF NURSING

ASSOCIATE IN ARTS

Nursing

Rebecca Elizabeth Atkinson _______ Clemson
Teresa Anne Degen ________________ Sumter
*Shirley Churney Fortson __________ Anderson
Marguerita McLaughlin Gillespie __ Greenville
Lynda Ann Kay __________________ Pendleton
*Vivien EsDorn Keeter _______________ Aiken
Marsha Jane Knight ______________ Anderson
Corinne Lafaye Morgan ___________ Columbia
*Karen Smith Morgan _____________ Clemson
Carol Lee Sanborn _____________ Spartanburg

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

George Williams Gage III -------- Fort Mill
Laurie Anne Holleman --------- Summerville
Michael Henry McClure ------------- Sumter
*Donald Craig MacVittie ---- Buffalo, N. Y.
*Margaret Anne Fay Schmidt
------------------------- Baltimore, Md.

BACHELOR OF SCIENCE

Chemistry

Herbert Branham, Jr. ----------- Charleston
Stanley Parks Cole, Jr. ------------ Langley
*Joseph Edward Davis, Jr. ---------- Sumter
Claudene Diane Elrod ------------ Anderson
Phillip Ryan Hayes ----------------- Mayo
Larry Mortimer Jackson ------------- Sumter
*James William Kronberg ------- Wedgefield
Robert Charles Schmidt, Jr.
-------------------- Old Tappan, N. J.
James Eric Whisenhunt III ------- Hartsville
Larry James White ------------------ Starr

Geology

J. Patrick Bruening -------------- Charleston
Richard Carson Cunningham, Jr.
------------------ Melbourne Beach, Fla.
Keith Ian McConnell ---------- Ephrata, Pa.
James Earl Wright, Jr. ------------ Anderson

Mathematics

Douglas Pounds Armistead ---- Decatur, Ga.
Gregory Scott Baker ---------------- Sumter
*Michael Feodor Carpenter
---------------------- North Charleston
**Mary Elizabeth Craig ------------ Camden
Steven Emerson Davis ------ Charlotte, N. C.
David Kendrick Duncan ------------ Sharon
*Thomas Barry Edwards -------- Ninety Six
Richard Winston Gooding -- Ridgewood, N. J.
**Raija Toolikki Griffin -- Tampere, Finland
Charles J. McKenzie III --------- Greenwood
*Leslie Edwin McKenzie, Jr. ---------- Dillon
Kenneth Allan Means -------------- Clemson
*Richard Carl Vaughan --------- Greenville

Medical Technology

Nancy Lord Lowdermilk --------- Greenville

Physics

James Shober Brawley, Jr. -- Salisbury, N. C.
†*Michael Eric Buchanan ------- Charleston
*Billy Bert Homan -------- Jacksonville, Fla.
*Calvin Tycho Howle ------------- Lancaster
Joseph Douglas James --------------- Aiken
William Dunlop Raffield II ------- Newberry
†***Mark George Savitsky --------- Clemson

Pre-Medicine

Arthur McFaddin Abbott ------------ Sumter
**Calvert Clay Alpert -------------- Sumter
Kenneth Kay Ashley, Jr. ------- Williamston
Durwood Earl Bach ------------ Bel Air, Md.
James Louis Bishop --------------- Taylors
*Wade Brantley Blount ---------- Belvedere
Garden Stuart Clarkson, Jr. ------- Columbia
John David Cox -------------------- Belton
Glenn Fletcher Cueman -------- Honea Path
*Joseph Euranus Fewell. Jr. ----------- York
James Cary Freeman ------------- Piedmont
*Dan Henry Gambrell, Jr. ------- Greenwood
David Gaines Gilstrap ------ Brevard, N. C.
*James Ross Hanahan, Jr. ----- Atlanta, Ga.
William Michael Heath ---------- Lancaster
James Andrew Henderson ------- Greenville
*Jeanne Rebecca Jenkins --------- Columbia
*William Richard Karpik --------- Anderson
**Bradford Lewis Keeney --------- Anderson
Francis Asbury Lawton III --- Gastonia, N. C.
*Marshall Augustus Leaman, Jr. -- Greenwood
Franklin Carver Lee ----------------- Troy
Frederick Frank Marshall -- Trumbull, Conn.
**Theodore Mark Meyer -------- Greenwood
Richard Neal Moss ------------ Charleston
Samuel Darby Pendergrass III -- Greenwood
**Wesley McArthur Pitts, Jr. ------ Columbia
Michael Edward Platt ----------- Rock Hill
William Curtis Richardson, Jr. -- Spartanburg
*Henry Leroy Richbourg, Jr. ---------- Dillon
Harold Grange Rish, Jr. --------- Greenville
Jeffrey Carter Rockwell -------- Orangeburg
***Kenneth Lamont Smith ------ Chesterfield
*Sidney Terrell Smith ------------ Bowman
Robert Cooper Terry --------------- Martin
David Allen Wardlaw ------------ Whitmire
James Ralph Williams ----------- Newberry
*James David Woodson ------------- Easley
*John Wesley Worsham ---------- Bamberg
*William Goley Wright ---------- Rock Hill

---

*With honor
**With high honor
***With highest honor
†With departmental honors

MASTERS' DEGREES CONFERRED MAY 7, 1971

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Agricultural Economics

William Anderson Thomas ---- Elberton, Ga.

Animal Science

Thomas Elliott Bonnette, Jr. ----- Orangeburg
Russell Gene Gaddy ------------ Atlanta, Ga.

Botany

William Barnes Pamplin --------- Columbia

Dairy Science

Allan Pond Curtiss, Jr. ------ Demarest, N. J.

Entomology

Paul Henry Carlson ---------- Chicago, Ill.
Thomas Marion Hill ---------------- Union

Nutrition

Larry James Bearden ------ Cartersville, Ga.

Zoology

Stephen Howard Best ---- Fayetteville, N. C.
Ronnie Russell Howard --- Mountain City, Tenn.

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of Agriculture and Biological Sciences and the College of Education.)

Joseph Craven Jones -------------- Florence
George Milton Reed, Jr. ---------- Anderson

MASTER OF EDUCATION

Carol Ann Childress Anderson --- Greenville
Charles Julian Bethea, Jr. ----------- McColl
Selma Smith Bettis ------------------ Saluda
Grady Spence Burgner -- Chattanooga, Tenn.
David Arthur Clyburn, Jr. ------ Spartanburg
Sarah Jean Smith Cross ------------- Seneca
Al Lee Curtis --------------------- Gaffney
Judy Meredith Faulkenberry ----- Townville
Eileene Adams Futral ---------- Alamo, Ga.
Cynthia Abernethy Holt ------ Orlando, Fla.
Marjorie Littlejohn Knuckles ------ Anderson
George Hervy O'Neal III ---------------------- Chattanooga, Tenn.
Julia Claudette Osborne ------ Hartwell, Ga.
Joan Mineo Protomastro ------------ Sumter
Michael Thomas Voiselle -------- Ninety Six

MASTER OF INDUSTRIAL EDUCATION

Robert Jeffrey Lake -------- Hicksville, N. Y.
Walter Price Spires --------------- Anderson

COLLEGE OF ENGINEERING

MASTER OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agriculture and Biological Sciences and the College of Engineering.)

John Frederick Long ------------- Newberry

Bioengineering

Stephen Joseph Morrison -- Thunderbolt, Ga.

Ceramic Engineering

Dennis Arthur Carlson -------- Marietta, Ga.

Chemical Engineering

James Edward Davis, Jr. ----------- Chester
Michael Alan Lake ------------- Jamestown

Electrical and Computer Engineering

James McCardell Davis, Jr. ------- Lancaster
Anil Gupta ---------------- Calcutta, India

Environmental Systems Engineering

Louis DesChamps Eckley -------- Bishopville
Don Richard McCombs ---------- Greenville

Materials Engineering

Donald Alan Kay ---------- Fair Lawn, N. J.

Mechanical Engineering

Sy-Li Victor Hsiang --------- Taipei, Taiwan
Charles Theodore Vollers III ---------------------- Jacksonville, Fla.

Water Resources Engineering

James Walker Gilreath -------- Decatur, Ga.
Floyd Edward Kimball, Jr. -- Strawplains, Tenn.

COLLEGE OF FOREST AND RECREATION RESOURCES

MASTER OF SCIENCE

Forestry

Robert Lewis Little ------------ Naples, Fla.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF SCIENCE

Management

James Plummer Chick, Jr. --------- Rock Hill
Timothy Powell Finn ----------- Greenville
Charles Donald Godsey -------- Greenwood
Pradeep Kumar Goorha ------ Kanpur, India
Walter Eugene Riggs -------- Madison, Ohio
Charles Wallace Seigler ---------- Rock Hill

Textile Chemistry

Edward Aloysius Duffy ---- Philadelphia, Pa.
Masahiro Kanai Tomioka -- Okayama, Japan

Textile Science

Clyde Sidney Cates, Jr. ---- Charlotte, N. C.
Lawrence Oliver Goldstein ----- Spartanburg
Vernon Alton Robbins, Jr. --------- Rock Hill
Harry Small ------------- Philadelphia, Pa.

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

English

Dennis Warren James --------------- Seneca
Ralph Kenneth Ostrom, Jr. ---- Marion, N. C.

History

Peggy Diane Neal ---------------- Kershaw

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

MASTER OF SCIENCE

Chemistry

Aiko Seo -------------- Hiroshima-Shi, Japan
Josh Jeter Starnes -------------- Greenwood

Mathematics

Julia Jackson Davis ----------- Orangeburg
Sharon Elizabeth Davis ---- Forest City, N. C.
William Warren Niemi -------- Quincy, Mass
Marvin Kenneth Reed ----- Zephyrhills, Fla.
William Arthur Strack ---- Arkadelphia, Ark.

Physics

Shih-Lin Chang ---------- Taichung, Taiwan

DOCTORS' DEGREES CONFERRED MAY 7, 1971

COLLEGE OF AGRICULTURE AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Agricultural Economics

Gaines Howard Liner .... Efland, N. C.
B.S., N. C. State University; M.S. Clemson University
Dissertation: Economic Analysis of Water Supply Alternatives in a Multi-County Industrialized Area

Entomology

Frederick Lance Wallace .... Columbus Junction, Iowa
B.S., Iowa Wesleyan College; M.S., Oklahoma State University
Dissertation: A Comparative Morphological Study of the Wing Venation of the Order Coleoptera

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

Jeffrey Scott Tennant .... North Augusta
B.S., M.S., Clemson University
Dissertation: The Theory of Moving Wall Boundary Layer Control and Experimental Application in Subsonic Diffusers (Field of Specialization: Mechanical Engineering)

William Kenneth Whitehead .... Comer, Ga.
B.S., University of Georgia; M.S., Clemson University
Dissertation: A Potential Theory Model for the Phytotoxicity of a Soil-Applied Herbicide (Field of Specialization: Agricultural Engineering)

John David Wrenn .... Greenwood
B.S., M.S., Clemson University
Dissertation: The Effect of Radiant Energy Transfer and Chlorophyll Concentration on the Growth Kinetics of Chlorella Pyrenoidosa TX 71105 in a Laminar Flow Photosynthetic Gas Exchange during Low Intensity Illumination (Field of Specialization: Chemical Engineering)

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

Augustus Kennerley Bonnette, Jr. .... North Charleston
B.S., College of Charleston
Dissertation: Isotopic Labelling for Mossbauer Studies: An Application to the Iron Cyanides

James Francis Cope .... Greenville
B.S., Hampden-Sydney College; M.S., Clemson University
Dissertation: Methylferrocyne

Ian Russell Hardin .... Birmingham, Ala.
B.S., Auburn University; M.S., Institute of Textile Technology
Dissertation: Light Scattering from Glass Fibers at Normal Incidence

Julian Edward McGill .... Smyrna
B.A., Erskine College; M.S., Clemson University
Dissertation: An Investigation of the Analytical Applications of Aminoiminomethanesulfinic Acid and the Determination of Cadmium

Marvin Leonard Mole, Jr. .... Warner Robins, Ga.
B.A., Berry College; M.S., Clemson University
Dissertation: Synthesis of Beta Eudesmol, A Bicyclic Sesquiterpene

William Alexander Tallon .... Greenville
B.S., M.S., Furman University
Dissertation: Solvent Effects on the NMR Spectra of Some Meta-Disubstituted Benzenes

Mathematics

Gerard Philip Protomastro -- Sumter
B.A., Montclair State College; M. A., University of Massachusetts
Dissertation: Separable Projection Property

Physics

James Cozby Byrd, Jr. -- Charleston
B.S., University of South Carolina; M.A., Emory University
Dissertation: Kinetics of Reorientation of Optically Oriented Vk Centers and Thermal Annihilation of NH_3Cl Centers in Irradiated Ammonium Chloride

William Voss McCanless -- Winston-Salem, N. C.
B.S., The Citadel
Dissertation: The Size and Temperature Dependence of the Electrical Resistivity of Indium and Zinc Whiskers

John Wendell Swardstrom -- Bridgewater, Mass.
B.S., Jamestown College; A.M., Temple University
Dissertation: The Crystal and Molecular Structure of Tris (4,4′— diaminodiphenylmethane) Sodium Chloride

BACHELORS' DEGREES CONFERRED AUGUST 7, 1971

COLLEGE OF AGRICULTURAL SCIENCES

BACHELOR OF SCIENCE

Agricultural Economics

Thomas Roger Collins ------ Livingston, N. J.
Frank John Price, Jr. ---------- Roselle, N. J.

Agronomy

John Patrick Tornstrom ------ Neshanic, N. J.

Animal Science

Wayne David Griffin --------------- Sumter
John Jacob Horres IV --------- John's Island
Nathan LeRoy Rohde ------ Kissimmee, Fla.
Robert Lawton Stewart ---------- Greenville

Dairy Science

**Emily Glenn Attaway ---------- Anderson
Terry Quain Sudduth ---------------- Greer

Horticulture

John Douglass Bonnette ------------ Clemson

Poultry Science

David Frank Thompson ---------- Greenville

COLLEGE OF ARCHITECTURE

BACHELOR OF ARTS

Pre-Architecture

Glenn Luther Bellamy -------- Myrtle Beach
Marsha Oates Ellis ------------ Spartanburg
Robert Earl Epps ---------- North Charleston
William Edmund Evans ------------- Sumter
Kenneth Marvin Ewan, Jr. ---- Newark, Del.
Stephen Elliott Hendricks --------- Columbia
Robert Bruce Leith ---------- Roseland, N. J.
Robert Stephen Wennersten ---- Wykoff, N. J.

BACHELOR OF SCIENCE

Building Construction

Nixon Eugene Cawood, Jr. ---- Augusta, Ga.
Joseph George Goeller ---- Union City, N. J.
Dana Gerard Pelletier ------------ Rock Hill
Conrad Wayne Wisinger -- Saddle Brook, N. J.

BACHELOR OF ARCHITECTURE

*William Paul Gilbert ------ Ellicott City, Md.
David Frederick Hunter ------ Wheaton, Md.
Arthur C. Jenkins III ------ Fayetteville, N. C.
Richard Wylly Molten, Jr. -------- Columbia
Fred Morgan Robinette ------------- Pacolet
Henry Joe Smith ------------------- Saluda

COLLEGE OF EDUCATION

BACHELOR OF ARTS

Elementary Education

Barbara Lou Beshears ---- Jacksonville, Fla.
**Brenda Spearman Dawkins ---- Greenville
*Diane Doolittle --------------------- Greer
Mary Jane Terry Freeman -------- Piedmont
Sherril Lynn Hamm ------------ Charleston
Sherry Lankford Powell ---------- Batesburg
*Catherine Kaufmann Ross ---------------------- Casselberry, Fla.
Martha Ann Smith -------------- Anderson
Mildred Allyn Wright ------------ Columbia

Secondary Education

James Stephen Clark -------- Arlington, Va.
**Cheryl Ann Gale ------------ Bassett, Va.
Claudia Ann Patience --------------- Belton
Nancy Snipes Woods --------------- Salters
Mary Theresa Wright ------------ Holly Hill

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

Charles Ray Cooper --------------- Florence
Edward Benson Earle, Jr. ------------ McBee
Edgar Bolt Johnson, Jr. -------------- Easley
James Christopher Thigpen -------- Florence

Industrial Education

Thomas John Condon ------- Alexandria, Va.
George Bernarr Hendricks --------- Bethune
James Francis James, Jr. ------------ Sumter
William Morris McClelion -- North Charleston
David Alexander McLellan ---------- Dillon
Michael Lee Tillirson ---------- Atlanta, Ga.

Science Teaching

James Reece Bennett --------------- Taylors
James Jonathan Jennings ------ Spartanburg

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Ceramic Engineering

Geela Bopeep Poteat ------------- Columbia
James William Wunch ---------- Greenville

Chemical Engineering

Robert William Brown --------- Orangeburg
Charles Marion Culbertson II -- Ware Shoals

Civil Engineering

George Clarence Ballentine -- Peapack, N. J.
Gerald Marvin Glenn ---------------- Greer
Charles Thomas Grimsley -- North Charleston
George C. Hixon, Jr. ------------ Easton, Pa.
Charles Harvey Holladay, Jr. ------- Sumter
William John Laubach, Jr. ---- Allentown, Pa.
Cole Livingston Page, Jr. --------- Williston
William Irby Reardon, Jr. ----------- Sumter
Agostino Peter Tortora ------ Yonkers, N. Y.
Joseph James Wiley III -------- Summerville

Electrical Engineering

James Irvin Miller --------------- Anderson
Jeffrey Wayne Smith -------- Concord, N. H.
Charles Victor Stoll, Jr. ------------ Kingstree

Mechanical Engineering

Dwayne Monroe Bell ---------- Honea Path
Alan Dorman Coker ------------ Lynchburg
John Arkell Glinn ----------- Richmond, Va.
Gregory L. Harding ---- Hackettstown, N. J.
Henry Lee Hopper ---------- North Augusta
Morris Wayne McColley --------- Greenville
John Arthur Mullis ---------- Savannah, Ga.
Robert Harvie Payne ------------ Darlington
James Leonard Stokes ------------- Johnston
Donald Neal Waller --------------- Beaufort
Charles Burton Whittaker, Jr.
-------------------- Margate City, N. J.

COLLEGE OF FOREST AND RECREATION RESOURCES

BACHELOR OF SCIENCE

Forestry

Al Heyward Sturgis III ----------- Rock Hill

Recreation and Park Administration

Ronald Craig Alexander	Greenville
Dean Joseph Anderson	Clemson
Robert Lawrence Bell	Orangeburg
David Ambrose Brown	Piedmont
Harold Andrew Carey, Jr.	Seneca
Francis Neil Cassady	Irmo
Lewis Felton Cato, Jr.	Clemson
Charles Edward Dilworth	Walhalla
Chester Dwayne Emerson	St. Paul, Minn.
Thomas Edward Hudgins	Fairfax, Va.
Frank Henry Irelan II	Clarksville, Ohio
Roy Algia Jones	Albion, N. Y.
James Luther LaFoy	Greenville
Adam Mangino	West Orange, N. J.
Charles Eugene Mayson	Greenville
Daniel O'Neal Miles	Coward
Charles Arthur Nelson	Anderson
Philip Wiggins Rogers, Jr.	Clinton
Benjamin Robert Sullivan	Clemson
William Alan Touchstone	Commerce, Ga.
Lester Allen Van Blaricom	Clemson
Wayne Carter Wells	Greenwood

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS

Arts and Sciences

Henry Thurston Bagnal, Jr.	Sumter
Samuel Roger Boykin	St. Charles
Terrence John Clyne	Rocky River, Ohio
Guy William Davis, Jr.	Greenville
Charles Jeter Glenn, Jr.	Union
John Thomas Hannon, Jr.	Greenville
Edwin Sharp Presnell	Asheboro, N. C.
Clyburn Scott Steele	Lancaster
Daniel Leon Vehorn	Anderson
Frank Howard Vogel	Lakewood, N. J.
Charles Augustus Williams	Greenville
David Milton Winkles, Jr.	Oswego

BACHELOR OF SCIENCE

Accounting

William Ronald Coleman	Clearwater
Stanley Leon Edge	Moore
Thomas Alan Henrikson	East Northport, N. Y.
Donald James Horres	Charleston

Administrative Management

Stephen Carlton Moseley	Tampa, Fla.

Industrial Management

John Douglas Bailey	Gray Court
John McCarley Cauthen	Rock Hill
Gary Lee Compton	Baltimore, Md.
James Flinn Douglas	Greenwood
*Henry Marvin Harrison	Greenville
Ralph Benjamin Hemphill	Greenville
Thomas Alan Henrikson	East Northport, N. Y.
James Rochelle McGee	Orangeburg
James Winton Martin, Jr.	Winnsboro
Earl Lewis Miller, Jr.	Spartanburg
John Edgar Patterson	Charlotte, N. C.
James Michael Powers	Charleston
David Harold Rowland	Central
Michael Dale Sargent	Liberty
William Mathews Self	Greenwood
Wade Monroe Smith	Woodside, Calif.

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS

Robert Bentley Adams	Kensington, Md.
William Manigault Barnwell	Yonges Island
Edwin Moore Campbell, Jr.	Hanover, Va.
John Nevins Carson	Biloxi, Miss.
Frank Richard DeLuca	Upper Saddle River, N. J.
Titus Duren	Sumter
Cheryl Lynn Floyd	Seneca
Edwin Francis Gillingham	Clemson
Gregory Kurt Grosz	Short Hills, N. J.
James Edwin Hall, Jr.	Anderson
*James Michael Hamer	Kingsport, Tenn.
Bruce Randall Harvey	Greenwood
*Gail Heriot	Cayce
*Elizabeth Hudson Jones	Seneca
**Larry Franklin McIntyre	Marion
Glenn McCall Manning	Greenville
Robert Edward Miller	Easley
Tony Joe Owens	Easley
Connie Blake Pinson	Bamburg
Thomas Bennett Ramsey	Clover
Edgar Gene Shelton	Orlando, Fla.
Allen Darby Smith	Greenville
*Donna Jean Smith	Wagener
Jack Spruill Vernon	Chesterfield
Charles Goodwin Whitmire, Jr.	Greenville

SCHOOL OF NURSING

ASSOCIATE IN ARTS

Nursing

Gayle Yvonne Ford ------------ Honea Path

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

Susan Elaine Cheek ------------- Greenville

BACHELOR OF SCIENCE

Biology

John Chapin Folsom, Jr. ---- Westport, Conn.
Newton Ralph Lester, Jr. --------- Pinewood
*Keith Sanders McCabe ----------- Kingstree
John Joseph Oxford, Jr. ---- Woodmere, N. Y.
Robert Roy Sands ------- Cocoa Beach, Fla.
David Cannon Smith ------------- Anderson
David Neil Smoak --------------- Rock Hill
Cheryl Eggert Turner --------------- Aiken
Foster Bradley Wardlaw, Jr. -- St. Matthews

Chemistry

Grady Alexander Layton ----- Timmonsville
Leroy Francis Owens, Jr. -- Silver Spring, Md.

Mathematics

David Edward Kaskin ------------ Hampton
*Brian Lee Klapman -------------- Camden

Medical Technology

Donna Williams Durfos ------------ Florence
**Laura Gaye Edwards ---- Tacoma, Wash.
*Meredith Ann Fleming Hammond --- Buffalo
*Nancy Verlin McDonell ------ Leesburg, Fla.

Physics

Randall Austin Briggs -------- Ft. Myers, Fla.

Pre-Medicine

Paul Otis Batson III ---------------- Marion
***Charles Theodore Beemer ---- Greenville
Randolph Sanford Calvo, Jr. ------ Anderson
Michael Van Clark ------------ Orangeburg
John Morrison Coakley ------------ Clemson
Philip Anthony Ellis -------------- Greenville
Daniel Hare Jones --------- North Charleston
Robert Carey Wheatley -------- Spartanburg
Larry Allen Williams ---------------- Greer

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* With honor
** With high honor
*** With highest honor

MASTERS' DEGREES CONFERRED AUGUST 7, 1971

COLLEGE OF AGRICULTURAL SCIENCES

MASTER OF SCIENCE

Horticulture

James Walker Painter ------------ Chesnee

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

Thomas Boyd Huffman ----------- Cameron
Roy Todd -------------------------- Marion
Bruce Franklin Wyatt -------------- Seneca

MASTER OF EDUCATION

Hazel Brock Alewine --------------- Belton
Faye Shealy Amick -------------- Newberry
Edna Dickerson Bagwell ------------ Pelzer
James Edward Barbary -------- Simpsonville
Dorothy Hawkins Baumgardner --- Anderson
Linda Evans Billings -------------- Florence
Frances Marshall Bowman -------- Anderson
Sidney Dale Brady --------------- Abbeville
Ferrell McDade Bridwell, Jr. --------- Moore
Gale Marie Brown ------------------ Belton
Walter Thomas Burriss ------ Brooklyn, N. Y.
Suzette Lee Cagle ------------------ Cayce
Barbara Ashley Campbell ------ Honea Path
Gary Ronald Chambers ------ Murphy, N. C.
Edith Mae Mahon Cook ------------ Laurens
Frank Elford Cook ----------------- Duncan
Robert Milton Crain -------------- Greenville
Stanley Bruce Creel ----------- Williamston
Pattie Dean Curry ---------------- Anderson
Donivan Paul Dempsey, Jr. ------ Greenville
Eunice Mae Dickerson -------------- Easley
Sallie Shirley Dorroh --------------- Seneca
Talberta Faye DuBose ------------ Turbeville
John Louis Foster -------- Madawaska, Me.
Barbara Wright Fox --------------- Clemson
Ann Walker Garrison ------ Salisbury, N. C.
James Edward Gerrald ------ Galivants Ferry
Kate Snyder Gillison -------------- Richland
Jenny Porter Hallman ------------ Greenville
Velma Yarbrough Hallman -------- Anderson
Grace Young Hamilton -------------- Easley
Martha Jean Smith Hampshire ---- Newberry
Helen Smith Hearn ------------------ Easley
Kaye Baker Heins ------ Newport News, Va.
Barbara Rawley Hinkle ------------ Central
Arramenta Murph Hite -------------- Seneca
Emily Corley Holleman -------- Westminster
Dorothy Black Honea ---------- Westminster
James Alex Hooks ---------- St. Pauls, N. C.
Jean Burgess Howe ------------ Spartanburg
Russell Archie Hughes, Jr. ---------- Olanta
William Carson Isaacs, Jr. --------- Pickens
Eva Lynda Johnson ----------------- Easley
Charmaine Voss Kenelly ---- Covington, La.
Donnie Ray King ------------------ Seneca
David Bennett Ledbetter ------- Williamston
Helen Smith Lee ----------------- Anderson
John Edward Liberty -------------- Clemson
Karen Sprinkle Lindsay ----------- Clemson
Eugene Lomax --------------- Spartanburg
Norma Humphries Love ----------- Walhalla
Patsy Black Lunsford -------------- Taylors
Norma Jean McDaniel --------- Spartanburg
Jane Ann Shoun McGee ------------------ Mountain City, Tenn.
John Thomas McGrath III -------- McCormick
Sherry Lynn Marchbanks --------- Clemson
Charlie Dale Martin ----------- Williamston
Richard Douglas Medlin ------- Williamston
Wallace Gordon Merck -------------- Central
Vance Edward Merritt --------- Brewer, Me.
Linda Curran Miller -------------- Greenville
Nancy Batson Mizelle -------- Burgaw, N. C.
Otis D. Nelson ------------- Columbus, Miss.
Helen Giannopoulos Newton -------------------- Tlessaloniki, Greece
Elma Allen Norris ---------------- Anderson
Martha Yeargin Norris ----------- Anderson
Jackie Kay Oakley --------------- Anderson
Bernice Turner Padgett -------------- Startex
Roger Williams Palmer ---- Gainesville, Fla.
Mary Crosby Paul --------------- Anderson
Carol Chastain Peavler ------ Shattuck, Okla.
Teresa Stroup Pettus -------------- Fort Mill
Nancy Bland Porcher --------------- Easley
Maryann Stackman Powell ------- Columbia
William Joseph Pridemore --------- Clemson
James Doyl Puckett ----------------- Seneca
Robert Calvin Quesenbury ------- Greenville
Frances Hudgens Revis --------- Greenville
David Wayne Rhodes ------------- Woodruff
Claude Meredith Rickman ---------- Central
Betty Potter Rogers -------------- Anderson
Evelyn Thorne Rogers ------------- Chesnee
Lowell Randall Russell --------- Dublin, Ga.
Gayle Buckheister Sawyer ------ Charleston
Patricia Ann Shanklin ------------ Anderson
James Garrison Smith, Jr. --------- Columbia

MASTER OF EDUCATION (Continued)

Virginia Belcher Stanley ---------- Rock Hill
John Alexander Stevenson ---------- Seneca
Ruth Ann Strum ---------------- Greenville
Donald Raymond Sturkie ---------- Pauline
Elmer Joe Tankersley --------------- Central
Hazel Shields Trent --------------- Clemson
Gale Garrett Werner -------- Travelers Rest
John Wilbur Wheeler III -------- Greenville
Shirley K. Whitfield ------------ Honea Path
Winnie Vaughan Williams --------- Clemson
Elizabeth Carter Wilson ---------- Anderson
Betty Davenport Workman ---------- Taylors

MASTER OF INDUSTRIAL EDUCATION

Calvin Newell Bowie, Jr --------- Due West
Phillip Allan Cooke ----------- Grayson, Ky.
Donald Ray Hill --------------------- Easley
James Sullivan Hull ------------ Greenwood
Herbert Hamilton Newton ----------- Central
William Roy Pipes ----------- Murphy, N. C.
Paul Henry Sanders ----------- Summerville
Roland Albert Scott --------------- Anderson
William Marion Thornton, Jr. ------ Columbia
John Williams, Jr. --------------- Greenville

COLLEGE OF ENGINEERING

MASTER OF SCIENCE

Bioengineering

Charles Camden McCarl -------- Mercer, Pa.

Civil Engineering

George Newman Allman ------ Hampton, Va.
George Gary Cox ------------------- Sumter
Michael Glenn Crowe ------------- Marietta
Joseph Banks Graham -------------- Chester
George Fouad Kammoun --- Tripoli, Lebanon
Reuben Sims Thomas -------------- Carlisle

Electrical Engineering

Hamilton King Avery III ------ Myrtle Beach
Samuel Williams Hammond -------- Piedmont

Materials Engineering

Charles Norman Wilson -- Worthington, Ohio

Water Resources Engineering

Terry Arnold Kingsmore ---------- Columbia

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF ARTS

Economics

Donald Rueben Adams --------------- Union

MASTER OF SCIENCE

Management

Russell Harlow Ash ---------- Cordell, Okla.
Keith Stackhouse Block, Jr. -- Chatham, N. J.
Ashish Brahma -------------- Cuttack, India
Keith Alan Crowley ------------ Spartanburg
William Gilder Godsey, Jr. ------ Greenwood
Richard Andrew Maxwell -------- Anderson

Textile Chemistry

John Hao-Kiang Chan ------ Naha, Okinawa
Rasjid Djufri ------------- Djokja, Indonesia
Samuel Robert Suber III
----------------- Kings Mountain, N. C.

Textile Science

Jarvis Allen Seabolt -------- Dahlonega, Ga.

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

English

Mary Elizabeth Cooper ------------ Pendleton
Janie Caves McCauley ------- Rossville, Ga.
William Patrick Riley ------ Lutherville, Md.
Anita Thurston Sullivan ------------ Clemson
Jane Gill Tombes ------------------ Clemson
Richard Hill Woodward ---- Knoxville, Tenn.

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Chemistry

Victor Alan Fishman ----------- Miami, Fla.

Mathematics

Jean Elliott Dunbar ------------- Spartanburg
Daniel Edgar Duncan ------------- Pageland
William George Frye ------------ Perry, Fla.
Albert Francis Jones -------- Dahlonega, Ga.
Ruth Pool Strzelecki ------------------ St. Simons Island, Ga.
Brian Gerard Von Gruben -- Baton Rouge, La.

Physics

Robert Wellington Blackwell ------ Tigerville

Wildlife Biology

Dan Marvin Connelly ------------- Hampton

Zoology

Jewel Askew Jordan ------ Luthersville, Ga.
Johnny Boyd Sandifer ---------- Orangeburg

DOCTORS' DEGREES CONFERRED AUGUST 7, 1971

COLLEGE OF AGRICULTURAL SCIENCES

DOCTOR OF PHILOSOPHY

Agricultural Economics

Dan Lucien McLemore ---------- Surrency, Ga.
B.S., Presbyterian College; M.S., Clemson University
Dissertation: Wholesale Demand Functions for Fresh Peaches in Twenty-three Markets

Entomology

William Bruce Ezell, Jr. ---------- Ninety-Six
B.S., Lander College; M.S., Clemson University
Dissertation: Biology and Control of Tabanidae at Charles Towne Landing Park, Charleston, South Carolina

John Wey Van Duyn ---------- Jacksonville, Fla.
B.S., M.S., University of Florida
Dissertation: Investigations Concerning Host Plant Resistance to the Mexican Bean Beetle, **Ephilachna varivestis** Mulsant, in Soybeans, **Glycine max** Merrill

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

James Willaim Epps ---------- Clemson
B.S., Clemson University
Dissertation: Economic Considerations for the Provision of Access to Rural Access-Controlled Highways (Field of Specialization: Civil Engineering)

Theodore Arden McCracken ---------- Branchville
B.S., M.S., Clemson University
Dissertation: A Systems Analysis for the Transport of Oxygen and the Simultaneous Transport of Oxygen, Carbon Dioxide, and Glucose in the Capillaries and Tissue of the Human Brain (Field of Specialization: Chemical Engineering)

Carl Donner Nelson, Jr. ---------- Charleston
B.S., Clemson University
Dissertation: An Analytical Design Method and Experimental Results for Axially Symmetrical Diffusers Having Incompressible, Unseparated Flow and Employing Slot Suction (Field of Specialization: Mechanical Engineering)

Thomas Benton Young III ---------- Columbia
B.S., M.S., Clemson University
Dissertation: A Dynamic Mathematical Model of the Chemostat (Field of Specialization: Bioengineering)

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY

Engineering Management

John Richard Fraker ---------- Clemson
B.S., M.S., University of Tennessee
Dissertation: Approximate Techniques for the Analysis of Tandem Queueing Systems

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

Alan Kendrick Torrence ---------- Asheville, N. C.
B. S., Davidson College; M.S., Clemson University
Dissertation: Synthetic Approaches to the Eremophilane Sesquiterpene Group

Mathematics

Robert Oscar Gamble ---------- Greensboro, N. C.
B.S., Duke University; M.S., Clemson College
Dissertation: On Prime-Order Matrices over Finite Local Rings

George William Marrah ---------- Lexington, Va.
B.S., Rhode Island University; M.S., Clemson University
Dissertation: Some Qualitative Theory for Stieltjes Integral Equations

David Albert Ott ---------- Ponchatoula, La.
B.S., Southeastern Louisiana University; M. S., Clemson University
Dissertation: Decision Theory for Averaged Risk

George Gerald Thompson ---------- Anderson
B.S., Clemson College; M.S., Clemson University
Dissertation: Some Generalized Radon and Helly Type Theorems in Combinatorial Geometry

Physics

Thomas Gordon Anderson, Jr. ---------- Charleston
B.S., Clemson University; M.S., University of South Carolina
Dissertation: Stage III Recovery of Electron Irradiated Aluminum

Lance Alden Duvall ---------- Highland Park, Mich.
B.S., Wayne State University
Dissertation: The Crystal and Molecule Structure of Univalent Ions with P-P'-Diamino-2,3-Diphenylbutane

James Edward Payne ---------- Chase City, Va.
B.S., Hampden-Sydney College; M.S., Clemson University
Dissertation: Nonlinear Flux Flow Resistivity in Superconducting Tin Films

Forrest James Woods ---------- Brookfield, Ill.
B.S., DePaul University; M.S., Clemson Univeristy
Dissertation: Integral Approximation Applied to the Dirac Equation

ASSOCIATE AND BACHELORS' DEGREES CONFERRED DECEMBER 16, 1971

COLLEGE OF AGRICULTURAL SCIENCES

BACHELOR OF SCIENCE

Agricultural Economics

William Keith Dozier -------------- Conway
Howard Randall Griggs --------- Hartsville
Alvin Judson Hurt, Jr. -------------- Easley
William Duke Kimbrell ------------- Sumter
Harold William McClintock, Jr. --------- Ora
Lawrence Calvin McMillan -------- Denmark
John Hugh Wheeler --------------- Saluda

Animal Science

John Robert Harris ------------- Westminster
Evelyn Crowson Jackson ---------- Camden
John Arthur Lesslie --------------- Rock Hill
Marion Glenn McLeod -------------- Sumter
Michael Ernest McMakin ------------ Lyman

Food Science

**Emily Suzanne Pickens ------ Spartanburg

Horticulture

Toney Clinton Boozer --------------- Inman
Robert Michael Culp ---------------- Inman
Michael Edwin King --------------- Easley
Philip Lawrence McClain ---------- Williston

COLLEGE OF ARCHITECTURE

BACHELOR OF ARTS

Pre-Architecture

John Michael Currie --------- Arlington, Va.
Robert Ervin Ellis, Jr. ----------- Greenville
Ralph Walter Hadley, Jr. --- Harriman, Tenn.
Mark Richards Hudson --- Randallstown, Md.
Leonardo Serrano ------ Quito-Ecuador, S. A.

BACHELOR OF SCIENCE

Building Construction

Jeffrey Wayne Adamo ------- Baltimore, Md.
Robert William Folkman, Jr. -- Medford, N. J.
William Jackson Free ----------- Greenwood
John Warren Geeslin ------ Falls Church, Va.
Carl Mabeary Hair, Jr. -------------- Aiken
Charles Gary Pringle --------------- Sumter
Don Albert Rupert ------------- Decatur, Ga.
Lawrence Bern Visconti ----- Stratford, Conn.

Bachelor of Architecture

Richard Lee Grimstead -- Virginia Beach, Va.

COLLEGE OF EDUCATION

BACHELOR OF ARTS

Elementary Education

*Carole Wilson Armfield ----------- Clemson
Linda Fay Brooks ---------------- Anderson
Patricia Fant Chancellor --------- Anderson
Kathy Shannon Cheatham ------- Newberry
**Linda Diane Davis ------------ Charleston
Nellie LaDene Davis ----------- Spartanburg
Elizabeth Byrd Fant -------------- Anderson
Sheila Gwynn Halstead ---------- Charleston
***Jean Simons Hatcher -------------- Aiken
*Jennie Lee Hendrix ------ Brownsboro, Ala.
Susan Gale Holcombe ----------- Largo, Fla.
Judy Gayle Jameson --------------- Easley
Bobbie Delony Lindstrom ------- Ozark, Ala.
Carol Ann McLellan --------------- Seneca
**Emily Browne Moore ---- Eastanollee, Ga.
Linda Kay Murray ---------- Gastonia, N. C.
*Betty Carolyn Pilgrim ----------- Anderson
Jon Harold Robinett -------------- Leesville
Helen Jeanette Ross -------------- Greenville
*Linda Johnson Shirley ----------- Pendleton
Melinda Jean Sutton -------- Laramie, Wyo.
Patricia Gail Tate ---------------- Anderson
*Debbie Inman Townsend ------ Bennettsville
**Mary Jean Washington ------ Decatur, Ala.

Secondary Education

Evelyn Dianne Batson (Degree awarded posthumously)	Travelers Rest
Joan Everett Birdsall	Atlanta, Ga.
**Eleanor Gayle Bolt	Greenwood
Rufus Brown	Florence
Victor Lee Cheek	Anderson
*Rebecca Freeman Cole	Pickens
Vivian Harleen Couick	Lancaster
Willard Raymond Foster	Ladson
**Karen Wilkes Gainey	Florence
Darrell Henry Garber	Scottsburg, Va.
*Susan Schumacher Garland	Walhalla
Beth Roe Garrett	Greer
***Chichi Ann Harris Herr	Maryville, Tenn.
Kenneth Ray Hull	Pickens
Philip James Legnetti	Brooklyn, N. Y.
Sara Mikolajczyk McCullough	Myrtle Beach
*Robby Edward Miller	Greer
Donald Eugene Neal	Walhalla
*Jeanette Owen Rogers	Greenville
Donald Edward Russell	Baltimore, Md.
Thomas Pickens Sheppard	Liberty
Clinton Meade Tucker	Greenville
Donald Arthur Wiggins	Scottsboro, Ala.
James Dee Witter	Chaffee, N. Y.

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

Timmy O'Neal Barr	Springfield
Marion Edgar Carter	Elliott
Heath Colbert Copeland	Clinton
Jason Mack Lynch, Jr.	Lynchburg
Charles Michael Newman	Sumter
*Freddie Clinton Waltz	Ruffin

Industrial Education

Miles Morgan Adair	Greenville
Randal Jackson Addison	Anderson
William Calvin Beattie, Jr.	Rumson, N. J.
**Joan Castelloe Bradshaw	Clemson
Larry James Bramlett	Greenville
Ronald Eric Byrd	Lancaster
**David Wayne Dailey	Spanish Fort, Ala.
Lloyd Linwood Elder, Jr.	Silver Spring, Md.
William Franklin Ferguson	Clover
Danny Earl Gregg	Columbia
Charles Lamar Harrison	Olar
Eugene Francis Higgins	Amityville, N. Y.
Stephen Dale Johnson	Pompano Beach, Fla.
Thomas Green Legare III	Yonges Island
Perry Thomas Macomson, Jr.	Shelby, N. C.
Oscar Frederick Molin, Jr.	Sea Cliff, N. Y.
Kenneth William Smith, Jr.	Allentown, Pa.
Van Norman Steadman	Williston
James Carlisle Stevenson	Richburg
Luther Langford Taylor, Jr.	Columbia
David Albert Tucker	Abbeville
Robert MacPherson Wood, Jr.	Atlanta, Ga.
Robert Scott Wylie	Blacksburg

Science Teaching

*Katherine Trevor Armstrong	Rock Hill
Claude William Corbett III	Pinewood
Joseph Trus Hayes III	Dillon
Roy Ernest Horton	Clinton
Robert Richard Knowles	Charleston
Wade Hampton McManus, Jr.	Richburg
**Jana Elledge Smith	Ware Shoals

COLLEGE OF ENGINEERING

BACHELOR OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.)

Lynn Zaco Dantzler	Santee
Jackie Thomas Rogers	Woodruff

Ceramic Engineering

Don Ellinwood Denison	Rocky River, Ohio
Gregory Alan Jones	Anderson
Aaron William Rentz III	Columbia

Chemical Engineering

William Curtis Bradley	Mt. Pleasant
Thomas Robert Conklin	Stamford, Conn.
Donald Hayne Fletcher	Ridgeland
David Bowers Miley	Charleston

Civil Engineering

Wilbert Beverly ---------------- Bennettsville
Pembroke Waugh Davis, Jr. --- Augusta, Ga.
James Donovan Dukes --------- Orangeburg
William Boyd Fant ---------------- Anderson
Ronald Fred Fisher ----------- Decatur, Ga.
*Charles Robert Froneberger ------------------------ Gastonia, N. C.
Richard Warren Galway -------- Greenville
Curtis Wilson Lybrand, Jr. ---------------------- Charleston Heights
Betty Jo-Ann Matthews ------------ Scranton
Dwight Junior Mehaffy ---- Black River, N. Y.
Jesse Woodall Moffett III ------------------- Poughkeepsie, N. Y.
Harry Mendel Reed, Jr. -------------- North
Ernest Leland Rinehart, Jr. ------ Greenwood
Guy Schwarting ---------- Huntington, N. Y.
William Stephen Shannon -- Westbury, N. Y.
Virginia Anne Stover ---------- Blacksburg
Herman Wilson Tillotson, Jr. ---- Spartanburg
William Joseph Wilfinger ----- Emmaus, Pa.

Electrical Engineering

Thomas Alan Bean -------- New Orleans, La.
Robert Henry Cauthen ,Jr. -------- Holly Hill
Jerry Odell Chapman --------------- Easley
*Marco Antonio Chen, Jr. -- Panama, Panama
Samuel Ray Harding ------- Montvale, N. J.
Clarence Wayne Lay --------------- Seneca
*Joseph Lukowski, Jr. --------------- Sumter
James Hilton Parsons III --------- Newberry
*James Vernon Piephoff, Jr. ------ Greenville
**Furman Douglas Ramsey ------ Greenville
Charles Walter Sharp, Jr. ----------- Sumter
Baron Karl Shuler -------------- Charleston
Hubert Thaddeus Shuler -------- Jamestown
Dominic John Susini --------- Camden, N. J.

Mechanical Engineering

Robert Joseph Beasley ---------- Charleston
John Ball Burroughs, Jr. ------ Kinston, N. C.
Craig Douglas Ellefson -------- Spartanburg
Christopher Warren Henderson ------------------ New Canaan, Conn.
Marvin Forrest LaBeck ------------ Mauldin
Lester Robert Patrick, Jr. ------- Orangeburg
Charles Ray Pearre, Jr. ---- North Charleston
Clinton James Powell ----------- Charleston
Richard Dale Randolph ------ Stanley, N. C.
Robert Joseph Tusso -------- Westfield, N. J.
Joseph Edward Vignati, Jr. --- North Augusta
James Larry Wells -------------- Greenwood

Technical Operations

Marvin Ronnie Baker -------- Midland, N. C.
John Gregory Denton -------- North Augusta
Robert Nelson Kay ------------------ Cayce

COLLEGE OF FOREST AND RECREATION RESOURCES

BACHELOR OF SCIENCE

Forestry

Floyd Samuel Douglass, Jr. ---- Chesterfield
Forrest Alan Henriksen ------- Palmyra, Pa.
*Greer Carson Hubbard ------ Orange, Texas

Recreation and Park Administration

William Giles Alverson III ---------- Union
Joseph William Boykin ------------ Rock Hill
Keenan Gary Craigo ------------ Greenville
James Waymond Culp --------------- Inman
Charles Louis Cuzzell III -------- Charleston
John Bradford Gilstrap ------------- Liberty
*John Warren Green -------------- Beaufort
Arthur Lee Haddock III ------- Atlanta, Ga.
Phil Lamar Hendricks --------------- Greer
Alan Johnstone --------------- Orangeburg
Michael Weaver Keeter -------------- Aiken
Charles Reuben Major, Jr. -------- Greenville
Michael Jerome Morgan -------- Catlett, Va.
*Carey Lee Rawlinson, Jr. --------- Manning
Jack Louie Ross III ------------- Anderson
*Bobby Ray Saylors ------------- Townville
William Randolph Taylor -------------------- Waynesville, N. C.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

BACHELOR OF ARTS

Arts and Sciences

Manfred Dworschak	Charleston
Marvin Snead Edwards, Jr.	Lyman
James J. Ellis, Jr.	Cincinnati, Ohio
Robert Daniel Garces	Jacksonville, Fla.
Charles C. Heck	Oak Park, Ill.
James David Hendrix	Spartanburg
Boyce Lee Muller	Columbia
Stephen Carlos Scott	Liberty
Louis Albert Stender	Charleston
James Francis Westbrook	Augusta, Ga.

BACHELOR OF SCIENCE

Accounting

Stephen Brian Henrikson	East Northport, N. Y.

Administrative Management

Allen Hardy Hodges	Clemson
Bobby Dale Malphrus	Ridgeland
Ronnie Keith Nettles	Ridgeland
Kenneth John Skoczylas	Melbourne, Fla.

Industrial Management

Stephen LeRan Altman	Lake City
Michael Farris Broome	Pageland
Harold Blakey Campbell	Charleston
Richard Earl Eppes	Greenville
Phillip Herbert Fleetwood	Greenville
Charles Calhoun Glasgow	Conway
Haskell Edgar Grant	Pickens
Robert Tatlow Hunt, Jr.	Spartanburg
John Wolfs Irving	Berkeley Heights, N. J.
Robert Walker Kirby	Weston, Conn.
John Austin Macauley	Princeton, N. J.
Raymond Herbert Pettit, Jr.	Spartanburg
Thomas David Scott	Charleston
Paul Richard Shish	Pittsburgh, Pa.
Henry Glenn Simpson	Lancaster
John Earle Skinner, Jr.	Liberty
Richard David Teal	Myrtle Beach
Walter Dixon Whetstone III	St. Matthews
Robert Bruce White	Greenville
Thomas C. Wiggins, Jr.	Tucker, Ga.

Textile Science

David Scott Rutland	Fairfax

COLLEGE OF LIBERAL ARTS

BACHELOR OF ARTS

***Gay Rita Adams	Clemson
*Anita Louise Kirk Akkas	Greenville
Cathy Dana Besser	Sumter
Donna Smith Brazeal	Easley
Iverson Oakley Brownell, Jr.	Greenville
David George Bryant	Salem, N. H.
*Jo Karen Busch	Walhalla
Franklin Witt Cannon	North
Everett Glen Craig	Lancaster
*Edwin Leslie Davis II	Annandale, Va.
Arthur Huger Driggers III	Atlanta, Ga.
John Wilson Floyd	Conway
*Cynthia Liane Gillespie	Spartanburg
Lewis Earl Gilstrap, Jr.	Easley
Thomas Woolard Grey	Greenville
Elizabeth Cannon Hancock	Olney, Md.
Connie Clyde Harness III	Orangeburg
Alford Haselden	Charleston
Dan Michael Herlong	Johnston
*Paul Michael Kelly	Anderson
**Mary Diane Kerr	Greenville
Dean Herbert Kress	Richmond, Va.
Gloria Bracken Lufi	Piedmont
*Arcada Fleming McCoy	Summerville
Pamela Kay McCreery	Ellicott City, Md.
Gordon Stephen Metsky	Summit, N. J.
Harold Christopher Nettles	Sumter
Nancy Claire Moore Price	Roselle, N. J.
William Jesse Seay III	Charlotte, N. C.
Deborah Wade Sherman	Piedmont
Frederick Mayson Stewart	Lake City
Russell Wayne Warren	Anderson
Clyde Turner Watson	Greenville
Barbara Rodgers Wilson	Lake City

SCHOOL OF NURSING

ASSOCIATE IN ARTS

Nursing

Mary Fincher Crenshaw	Sumter

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

BACHELOR OF ARTS

Arts and Sciences

Faye LaPonza Ruff Houston	Columbia
William John Morris	Laurel Springs, N. J.
Robert Grant Phillips, Jr.	Walhalla
Charles Albert Seijo	Silver Spring, Md.

BACHELOR OF SCIENCE

Biology

Brainard Lee Ackley, Jr.	Salisbury, Md.
Joseph Gary Bagwell	Greer
**Ellen Hall Calhoun	Lexington, N. C.
James Keith Coleman	Inman
**Harry Wilson Findley, Jr.	Anderson
Carole Rebecca Flitter	Columbia
Curtis Cecil Gentry	Spartanburg
Suzanne George	Elkton, Md.
*Raymond Duane Harrell	Clemson
John Leroy Hensel, Jr.	Columbia
David Alan Koczan	Edison, N. J.
Lawrence William Lesemann	Charleston
William Morrall McCabe	Kingstree
*David Kenneth Riddle	Spartanburg
Andrew John Saranko	Lithia, Fla.
Hubert Hollins Settle III	Albany, Ga.

Chemistry

Leslie Denise McNair	Jackson

Geology

Roderick McIver Watson II	Ridge Spring

Mathematics

Joyce Paschal Lofton	Clemson

Physics

Michael Faison Borke	Charleston

Pre-Medicine

Larry Allen Black	Greenville
Joseph LeGette Bostick, Jr.	Pamplico
*Herbert Galen Grantham	North Charleston
Ronald Walden Milam	Statesville, N. C.
*Lawrence Edgar Stroud, Jr.	Great Falls

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* With honor

** With high honor

*** With highest honor

MASTERS' DEGREES CONFERRED DECEMBER 16, 1971

COLLEGE OF AGRICULTURAL SCIENCES

MASTER OF AGRICULTURE

Daniel Andrew Durfos ---- Fair Lawn, N. J.

MASTER OF SCIENCE

Agronomy

John Smith Boswell, Jr. ---------- Manning
Thomas Hampton Wright, Jr. --------- Dillon

Entomology

Heyward Belzer Douglass -------- Columbia

Nutrition

C. Murphy Hall, Jr. ------------ Mobile, Ala.

Poultry Science

Su-ming Hou --------------- Taipei, Taiwan

COLLEGE OF ARCHITECTURE

MASTER OF ARCHITECTURE

John Lester Thompson, Jr. ------- Greenville

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

Allen Carol Bennett --------------- Duncan
Fred Morgan ----------------------- Easley
Con Allen Powell, Jr. --------------- Union

MASTER OF EDUCATION

Ella Ruth Adams --------------- Anderson
Robert Shepherd Allen ---- Wadesboro, N. C.
Tommie Schade Barnes ---- Nashville, Tenn.
James Knox Carson -------------- Anderson
George Robert Crain ---------------- Greer
Charles William Davis ----------- Anderson
Daniel Murdock Ferguson, Jr. -- Spartanburg
Robert Quillen Finley -------------- Easley
Karen Winecoff Gilstrap ---- Charlotte, N. C.
John Charles Hearn ---------------- Easley
Nancy Ann Hill --------------- Honea Path
Dorothy Pilgrim Kellam ----------- Anderson
Ray Conner Kimbrell ------------ Anderson
Jack Herbert King -------- Wilmington, N. C.
Verta Yates Koelsch ------ Willoughby, Ohio
Jenny Keels Loftis -------------- Summerton
James Hammond Mozley III ---------- Seneca
Rosa Gressette Reid ----------- Orangeburg
Charles Raymond Shick ---- Lickingville, Pa.
Wayne Marion Smith ------------ Walhalla
Christine Anne Mercier Snoddy ---- Clemson
Glenn Dell Turner ----------------- Central
Carolyn Sue Van Loh ---------- Tyler, Minn.
Robert Edmond West ------------ Greenville
Martha Catherine Wilkinson -------- Taylors
Milton Earle Williamson ----------- Donalds

COLLEGE OF ENGINEERING

MASTER OF ENGINEERING

John Godwin Federline ---------- Greenville

MASTER OF SCIENCE

Bioengineering

Larry Stanley Bowman ------ Baltimore, Md.
Hsin I. Huang ------------- Tainan, Taiwan

Ceramic Engineering

William Frederick Brandt ---------- Easley
John Hale Johnson -------- College Park, Ga.

Chemical Engineering

Robert Miller Ward, Jr. ----------- Rock Hill

Civil Engineering

David Ronald Brabham -------- St. Stephens
Charles Edward Davies -------- Honea Path
Richard Henry Francis Kapp ---- Greenville
James Jacob Steele ---------- Arlington, Va.

Electrical Engineering

Tze-Ying Chiang ------------ Taipei, Taiwan
James Arthur Miller -- Melbourne Beach, Fla.
Mehmet Mustafa Ongay ------ Konya, Turkey
Robert Andrew Pace ------- Asheville, N. C.

Engineering Mechanics

Lien-Yan Chen ------------ Tainan, Taiwan
William Albert Venezia -- Ft. Lauderdale, Fla.

Environmental Systems Engineering

Thomas Osborn Barnwell, Jr. -- Yonges Island
Shirley Sheau-mei Hwang Chao ---------------------- Taichung, Taiwan
Yancy Jienven Chaung ---- Hu-Wei, Taiwan
Charles Roper Jeter --------------- Carlisle
Wayne Michael Kachel ------ Amherst, Ohio
Robert Francis Martin ----------- Greenville
Barry Wilson Peterman ------- Pascoag, R. I.

Mechanical Engineering

Chao-Tze Chang -------- Kaohsiung, Taiwan
John Anthony Pearce -------- North Augusta
William Russell Walden ------------ Moore

Water Resources Engineering

James Rhett Hendricks, Jr. ---------- Pelzer
George Purvis Nelson, Jr. ------- Charleston
Diego Suarez R. ------------- Riverside, Cal.
Joel Oscar Tyner III -------------- Florence

COLLEGE OF FOREST AND RECREATION RESOURCES

MASTER OF SCIENCE

Forestry

Ryan Ralph Faulkenberry ------- Lancaster

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF ARTS

Economics

Ralph Buck Black --------------- Prosperity

MASTER OF SCIENCE

Textile Science

John Frederick Alexander, Jr. ----- Clemson
John Edwin Pendergrass -------- Macon, Ga.

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS

English

Susan Tankersley Findley ------- Greenville
Dwight Cletus Hartsell ----- Oakboro, N. C.
Linda Lane Kay ---------- Fair Lawn, N. J.
Nancy Ryerson Milliken ---- Lake Forest, Ill.

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE

Chemistry

Donna Eloise Hindman ------------ Rock Hill

Mathematics

Colonel Jack Gaddy -------- Crescent Beach

Microbiology

Martha Lee Boswell --------------- Florence

Physics

Wayne Thomas Davis --- Hillsborough, N. C.
Charles Garrison Shirley, Jr. -------- Seneca

Zoology

John Frank Ellenberg, Jr. ------- Greenwood

DOCTORS' DEGREES CONFERRED DECEMBER 16, 1971

COLLEGE OF AGRICULTURAL SCIENCES

DOCTOR OF PHILOSOPHY

Agricultural Economics

John William McAlhany ---------- Reevesville
B.A., Furman University; M.S., Clemson University
Dissertation: An Economic Determination of the Optimum Size Cotton Gin for South Carolina

Marshall Burrell Richardson ---------- Charleston Heights
A.B., Newberry College; M.A., Clemson University
Dissertation: A Study of the Cost of Waste-Water Treatment to Wet Process Textile Plants in South Carolina

Entomology

John Carlton French ---------- Samson, Ala
B.S., M.S., Auburn University
Dissertation: The Damage and Control of the Lesser Cornstalk Borer, **Elasmopaltus lignosellus** (Zeller), on Peanuts and the Effect of Soil Moisture on Its Biology

Plant Pathology

James DeLos Arnett, Jr. ---------- North Augusta
B.S., M.S.; University of South Carolina
Dissertation: Studies on the Epidemiology, Etiology and Distribution of Fusarium Canker of Yellow Poplar in South Carolina

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

Kumar Gobindram Bhatia ---------- Bombay, India
B.S., Ranchi University; M.M.E., University of Virginia
Dissertation: Optimization of Structures to Satisfy Aeroelastic Constraints (Field of Specialization: Mechanical Engineering)

Larry Gene Blackwell ---------- Philadelphia, Miss.
B.S., University of Mississippi; M.S., Georgia Institute of Technology
Dissertation: A Theoretical and Experimental Evaluation of the Transient Response of the Activated Sludge Process (Field of Specialization: Environmental Systems Engineering)

Daniel Harrington Hunt ---------- North Augusta
B.S., M.S., Clemson University
Dissertation: Oxygen Transport in the Brain, Microcirculation by a Hybrid Computer, Nonlinear Monte Carlo Method (Field of Specialization: Chemical Engineering)

Ramesh Chander Jain ---------- New Delhi, India
M.S., Clemson University
Dissertation: An Iterative Linear Programming Technique for Multi-Period, Multi-Plant and Multi-Product Scheduling with Discrete Cost Function (Field of Specialization: Electrical Engineering)

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

Alan Scott Day ---------- Marlboro, Mass.
B.S., Hampden-Sydney College; M.S., Clemson University
Dissertation: The Mechanism of Allylic Alcohol Isomerizations

Samuel Jones Price III ---------- Birmingham, Ala.
B.S., Emory University; M.S., Clemson University
Dissertation: Part I: A Total Synthesis of Piperovatine. Part II: Synthetic Approaches to the Acorone Sesquiterpenes

Mathematics

Francis Russell Richards ---------- Shreveport, La.
B.S., Louisiana Polytechnic Institute; M.S., Clemson University
Dissertation: Repairable Item Inventory Models

Physics

James Warren Cook, Jr. ---------- Mobile, Ala.
B.S., Auburn University; M.S., University of Alabama
Dissertation: Effect of Uniaxial Tension on the Superconducting Transition Temperature of Tin and Tin Alloy Whiskers

Leland Rose Kirkland, Jr. ---------- South Hill, Va.
B.S., Virginia Polytechnic Institute and State University; M.S., Emory University
Dissertation: Electron Irradiation Effects in Aluminum Single Crystals

Albert Bruce Pruitt ---------- Anderson
B.S., Presbyterian College; M.S., Clemson University
Dissertation: Radiation Damage in Polycrystal and Single Crystal Copper

Richard John Roedersheimer ---------- Covington, Ky.
A.B., Villa Madonna College; M.S., University of Dayton
Dissertation: On Two-and Three-Body Intermolecular Forces

DEGREES AWARDED IN 1970-71 BY MAJOR COURSES

ASSOCIATE DEGREES AWARDED IN 1970-71

School of Nursing		12
Nursing	12	
Total Associate Degrees Awarded in 1970-71		12

BACHELORS' DEGREES AWARDED IN 1970-71

College of Agriculture and Biological Sciences [*]		121
Agricultural Economics	19	
Agronomy	16	
Animal Science	20	
Biology	47	
Dairy Science	6	
Entomology	0	
Food Science	1	
Horticulture	7	
Poultry Science	5	
College of Architecture		78
Architecture	33	
Building Construction	16	
Pre-architecture	29	
College of Education		164
Agricultural Education	26	
Elementary Education	39	
Industrial Education	29	
Science Teaching	14	
Secondary Education	56	
College of Engineering		212
Agricultural Engineering	5	
Ceramic Engineering	11	
Chemical Engineering	27	
Civil Engineering	67	
Electrical Engineering	46	
Engineering Analysis	2	
Mechanical Engineering	51	
Metallurgical Engineering	3	
College of Forest and Recreation Resources		88
Forestry	23	
Recreation and Park Administration	65	
College of Industrial Management and Textile Science		184
Accounting	5	
Administrative Management	1	
Arts and Sciences	69	
Industrial Management	100	
Textile Chemistry	2	
Textile Science	2	
Textiles	5	
College of Liberal Arts		136
Arts and Sciences	136	
College of Physical and Mathematical Sciences [†]		127
Arts and Sciences	9	
Biology	9	
Chemistry	15	
Geology	5	

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[*] Changed to College of Agricultural Sciences July 1, 1971.

[†] Changed to College of Physical, Mathematical, and Biological Sciences July 1, 1971.

Mathematics	17	
Medical Technology	10	
Physics	9	
Pre-medicine	53	
TOTAL BACHELORS' DEGREES AWARDED IN 1970-71		1,110

MASTERS' DEGREES AWARDED IN 1970-71

COLLEGE OF AGRICULTURAL AND BIOLOGICAL SCIENCES *		22
Agricultural Economics	1	
Animal Science	3	
Biochemistry ‡	1	
Botany ‡	2	
Dairy Science	1	
Entomology	2	
Horticulture	3	
Microbiology ‡	3	
Nutrition	1	
Poultry Science	1	
Wildlife Biology ‡	1	
Zoology ‡	3	
COLLEGE OF EDUCATION		150
Agricultural Education	6	
Education	130	
Industrial Education	14	
COLLEGE OF ENGINEERING		42
Agricultural Engineering	3	
Bioengineering	3	
Ceramic Engineering	4	
Chemical Engineering	4	
Civil Engineering	8	
Electrical Engineering	8	
Engineering Mechanics	1	
Environmental Systems Engineering	4	
Materials Engineering	2	
Mechanical Engineering	2	
Water Resources Engineering	3	
COLLEGE OF FOREST AND RECREATION RESOURCES		1
Forestry	1	
COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE		31
Economics	1	
Management	18	
Textile Chemistry	6	
Textile Science	6	
COLLEGE OF LIBERAL ARTS		12
English	10	
History	2	
COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES †		24
Chemistry	5	
Mathematics	12	
Physics	4	
Wildlife Biology ‡	1	
Zoology ‡	2	
TOTAL MASTERS' DEGREES AWARDED IN 1970-71		282

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* Changed to College of Agricultural Sciences July 1, 1971.

† Changed to College of Physical, Mathematical, and Biological Sciences July 1, 1971.

‡ Transferred to College of Physical, Mathematical, and Biological Sciences July 1, 1971.

DOCTORS' DEGREES AWARDED IN 1970-71

College of Agriculture and Biological Sciences *		10
Agricultural Economics	3	
Agronomy	1	
Animal Physiology	2	
Entomology	3	
Nutrition	1	
College of Engineering		12
Agricultural Engineering	1	
Bioengineering	1	
Chemical Engineering	4	
Civil Engineering	1	
Electrical Engineering	1	
Engineering Mechanics	2	
Mechanical Engineering	2	
College of Industrial Management and Textile Science		2
Engineering Management	2	
College of Physical and Mathematical Sciences *		25
Chemistry	10	
Mathematics	7	
Physics	8	
Total Doctors' Degrees Awarded in 1970-71		49
Total Number Degrees Awarded in 1970-71		1,453

TOTAL DEGREES AWARDED BY MAJOR COURSES, 1896-1971

Major Course	
Associate	
Nursing	98
Bachelors'	
Accounting	5
Administrative Management	1
Agricultural Chemistry	102
Agricultural Economics	365
Agricultural Education	487
Agricultural Engineering	480
Agriculture	244
Agriculture and Animal Industry	80
Agriculture and Chemistry	69
Agronomy	795
Animal Science	819
Applied Mathematics	34
Architectural Engineering	118
Architecture	683
Arts and Sciences	1,839
Bachelor of Science	3
Biology	278
Botany	12
Building Construction	71
Ceramic Engineering	244
Chemical Engineering	469
Chemistry	413
Chemistry and Geology	11
Chemistry-Engineering	43
Civil Engineering	1,521

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* Changed to College of Physical, Mathematical, and Biological Sciences July 1, 1971.

Major Course	
Dairy Science	407
Education	242
Electrical Engineering	1,860
Elementary Education	99
Engineering Analysis	2
Engineering Industrial Education	70
Entomology	166
Food Science	15
Forestry	232
General Science	359
Geology	25
Horticulture	497
Industrial Education	439
Industrial Engineering	138
Industrial Management	1,261
Industrial Physics	56
Mathematics	136
Mechanical Engineering	1,613
Mechanical and Electrical Engineering	489
Medical Technology	25
Metallurgical Engineering	18
Physics	102
Poultry Science	53
Pre-architecture	40
Pre-medicine	577
Recreation and Park Administration	201
Science Teaching	58
Secondary Education	172
Soils	9
Textile Chemistry	331
Textile Engineering	1,060
Textile Industrial Education	85
Textile Management	306
Textile Manufacturing	1,045
Textile Science	42
Textiles	34
Veterinary Science	16
Vocational Agricultural Education	729
Weaving and Design	42

Double Majors

Agricultural Chemistry and Arts and Sciences	1
Agricultural Chemistry and General Science	1
Agricultural Economics and Animal Husbandry	1
Agricultural Economics and Vocational Agricultural Education	1
Agricultural Engineering and Civil Engineering	2
Agricultural Engineering and Electrical Engineering	1
Agricultural Engineering and Mechanical Engineering	1
Agronomy and Agricultural Education	1
Agronomy and Vocational Agricultural Education	4
Animal Husbandry and Industrial Management	1
Animal Husbandry and Vocational Agricultural Education	5
Animal Husbandry and Agricultural Education	3
Animal Husbandry and Ceramic Engineering	1
Animal Husbandry and Dairy	2
Architectural Engineering and Architecture, five-year	1
Architecture and Architectural Engineering	11
Architecture and Civil Engineering	1
Architecture, four-year, and Architecture, five-year	18
Architecture, four-year, and Mechanical Engineering	1

Major Course

Arts and Sciences and Agricultural Economics	1
Chemical Engineering and Chemistry and Chemistry-Engineering	3
Chemical Engineering and Chemistry-Engineering	1
Chemistry and Chemical Engineering	1
Chemistry and Chemistry-Engineering	1
Chemistry and General Science	1
Chemistry and Industrial Physics	1
Chemistry and Agricultural Chemistry	1
Civil Engineering and Architecture	1
Civil Engineering and Chemistry and Geology	2
Civil Engineering and Industrial Physics	1
Civil Engineering and Electrical Engineering	1
Civil Engineering and Mechanical Engineering	1
Electrical Engineering and Applied Mathematics	1
Electrical Engineering and Industrial Physics	1
Electrical Engineering and Mechanical Engineering	17
Electrical Engineering and Textile Engineering	1
Entomology and Architecture, five-year	1
Entomology and Pre-medicine	1
General Science and Ceramic Engineering	1
General Science and Education	1
General Science and Electrical Engineering	1
Horticulture and Agronomy	1
Horticulture and Architectural Engineering	1
Horticulture and Civil Engineering	1
Industrial Education and Architecture	1
Industrial Education and Electrical Engineering	1
Industrial Education and Forestry	1
Industrial Engineering and Mechanical Engineering	1
Mechanical Engineering and Textile Engineering	4
Poultry and Vocational Agricultural Education	1
Pre-medicine and Arts and Sciences	1
Pre-medicine and Textile Chemistry	2
Textile Chemistry and Civil Engineering	1
Textile Chemistry and Textile Manufacturing	1
Textile Engineering and Civil Engineering	1
Textile Engineering and Mechanical and Electrical Engineering	1
Textile Engineering and Textile Industrial Education	1
Textile Engineering and Textile Manufacturing	1
Textile Engineering and Weaving and Designing	1
Textile Manufacturing and Mechanical Engineering	1

MASTERS'

Agricultural Economics	82
Agricultural Education	89
Agricultural Engineering	40
Agronomy	29
Animal Science	29
Architecture	6
Bacteriology	6
Biochemistry	1
Bioengineering	6
Botany	4
Ceramic Engineering	64
Chemical Engineering	53
Chemistry	99
City and Regional Planning	2
Civil Engineering	53
Dairy Science	22
Economics	7

Major Course	
Education	378
Electrical Engineering	48
Engineering Mechanics	9
English	29
Entomology	64
Environmental Systems Engineering	26
Forestry	10
History	8
Horticulture	67
Industrial Education	54
Industrial Management	36
Management	28
Materials Engineering	3
Mathematics	96
Mechanical Engineering	63
Microbiology	9
Nuclear Science	3
Nutrition	3
Physics	62
Plant Pathology	17
Plant Physiology	2
Poultry Science	16
Textile Chemistry	50
Textile Industrial Education	1
Textile Science	11
Textiles	1
Water Resources Engineering	26
Wildlife Biology	2
Zoology	62

DOCTORS'

Agricultural Economics	11
Agricultural Engineering	2
Agronomy	13
Animal Physiology	5
Bioengineering	5
Chemical Engineering	15
Chemical Physics	2
Chemistry	55
Civil Engineering	3
Electrical Engineering	5
Engineering Management	6
Engineering Mechanics	5
Entomology	24
Environmental Systems Engineering	2
Materials Engineering	2
Mathematics	16
Mechanical Engineering	6
Nutrition	3
Physics	32
Plant Pathology	7
Zoology	3
TOTAL DEGREES AWARDED 1896-1971	24,454

ENROLLMENT BY COUNTIES AND STATES
FIRST SEMESTER, 1971-72

County	*Total*
Abbeville	65
Aiken	147
Allendale	17
Anderson	554
Bamberg	25
Barnwell	31
Beaufort	34
Berkeley	51
Calhoun	23
Charleston	337
Cherokee	62
Chester	58
Chesterfield	46
Clarendon	41
Colleton	60
Darlington	102
Dillon	41
Dorchester	75
Edgefield	37
Fairfield	34
Florence	162
Georgetown	29
Greenville	993
Greenwood	212
Hampton	36
Horry	117
Jasper	15
Kershaw	77
Lancaster	66
Laurens	120
Lee	22
Lexington	135
McCormick	11
Marion	39
Marlboro	29
Newberry	75
Oconee	246
Orangeburg	158
Pickens	587
Richland	277
Saluda	41
Spartanburg	290
Sumter	169
Union	29
Williamsburg	33
York	160
SOUTH CAROLINA TOTAL	5,968

State or Country	*Total*
Alabama	36
Argentina	2
Arizona	1
Arkansas	5
California	11
Canada	2
Canal Zone	7
Chile	1
Colombia	1
Colorado	3
Connecticut	45
Delaware	32
District of Columbia	15
Ecuador	1
England	3
Ethiopia	1
Florida	159
France	1
Georgia	248
Germany	1
Guatemala	1
Hawaii	3
Hong Kong	5
Illinois	12
India	18
Indiana	8
Iowa	5
Israel	1
Japan	2
Kentucky	15
Lebanon	2
Libya	1
Louisiana	17
Maine	1
Maryland	177
Massachusetts	32
Michigan	7
Minnesota	2
Mississippi	5
Missouri	4
Nebraska	1
New Hampshire	2
New Jersey	265
New Mexico	2
New York	158
Nicaragua	1
North Carolina	242
North Dakota	2
Ohio	40
Oklahoma	3
Oregon	1
Pakistan	4
Panama	2
Pennsylvania	137
Peru	3
Puerto Rico	5
Rhode Island	9
South Carolina	5,968
Taiwan	18
Tennessee	53
Texas	10
Thailand	2
Turkey	4
Vermont	1
Viet Nam	1
Virginia	122
Washington	3
West Virginia	10
Wisconsin	2
Wyoming	1
GRAND TOTAL	7,965

ENROLLMENT BY COUNTIES
FIRST SEMESTER, 1971-72 (Greenville and Sumter Campuses)

County	*Greenville*	*Sumter*	*Total*
Aiken		1	1
Anderson	14	1	15
Barnwell		1	1
Berkeley		2	2
Charleston	1		1
Chesterfield		3	3
Clarendon		18	18
Colleton	1		1
Darlington		3	3
Florence		2	2
Greenville	208	1	209
Jasper	1		1
Kershaw		6	6
Laurens	5		5
Lee		3	3
Lexington		1	1
Marion		2	2
Newberry	1		1
Orangeburg		1	1
Pickens	6		6
Richland		1	1
Spartanburg	7	1	8
Sumter		182	182
Williamsburg		1	1
TOTAL	244	230	
SOUTH CAROLINA TOTAL			474

TOTAL ENROLLMENT BY COURSES AND ACADEMIC CLASSIFICATION, CLEMSON UNIVERSITY
FIRST SEMESTER, 1971-72

Major Course	Freshman (Semester)		Sophomore (Semester)		Junior (Semester)		Senior (Semester)		Total
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	
Agricultural Economics	14	4	6	1	13	6	18	10	72
Agricultural Engineering	12	2	6	1	3	1	6	2	33
Agricultural Mechanization	0	0	0	0	0	0	0	0	0
Agriculture	2	0	0	0	0	0	0	0	2
Agronomy	4	1	7	1	7	1	7	1	29
Animal Industries	3	1	1	0	2	2	0	0	9
Animal Physiology	0	0	0	0	0	0	0	0	0
Animal Science	10	2	5	2	10	7	9	5	50
Dairy Science	4	0	2	1	3	1	3	0	14
Entomology	1	3	1	1	1	0	3	1	11
Food Science	5	2	1	1	2	1	7	1	20
Horticulture	6	0	4	3	22	4	10	5	54
Nutrition	0	0	0	0	0	0	0	0	0
Plant Pathology	0	0	0	0	0	0	0	0	0
Plant Physiology	0	0	0	0	0	0	0	0	0
Plant Sciences	4	0	0	0	0	1	0	0	5
Poultry Science	2	1	3	0	0	0	1	1	8
Pre-veterinary	51	10	26	2	7	2	1	0	99
Wildlife Biology	0	0	0	0	0	0	0	0	0
Sub-Total	118	26	62	13	70	26	65	26	406
Architecture	0	0	0	0	0	0	2(a)	7(c)	9
Building Construction	22	7	12	1	12	4	24(b)	11(d)	93
City and Regional Planning	0	0	0	0	0	0	0	0	0
Pre-architecture	85	21	42	11	27	4	29	10	229
Visual Studies	0	0	0	0	0	0	0	0	0
Sub-Total	107	28	54	12	39	8	47	21	331
Education (Non-Degree)	0	0	0	0	0	0	0	0	0
Admin. and Supervision	0	0	0	0	0	0	0	0	0
Agricultural Education	5	1	4	5	17	8	16	11	67
Early Childhood Education	32	3	15	1	10	0	5	1	67
Elementary Education	98	27	81	17	72	16	42	29	382
Industrial Education	11	11	11	12	40	18	40	28	171
Personnel Services	0	0	0	0	0	0	0	0	0
Reading	0	0	0	0	0	0	0	0	0
Science Teaching	4	3	7	1	8	3	9	7	42
Secondary Education	65	23	70	15	65	38	54	27	357
Sub-Total	215	68	188	51	212	83	166	103	1,086
Engineering	19	0	0	0	0	0	0	0	19
Bio-Engineering	0	0	0	0	0	0	0	0	0
Ceramic Engineering	6	2	9	2	18	3	9	7	56
Chemical Engineering	55	6	29	6	27	6	23	15	167
Civil Engineering	65	28	46	9	36	13	39	25	261
Electrical Engineering	96	18	47	10	53	16	55	29	324
Engineering Analysis	7	1	8	2	2	3	2	4	29
Engineering Mechanics	0	0	0	0	0	0	0	0	0
Environmental Sys. Eng.	0	0	0	0	0	0	0	0	0
Industrial Engineering	0	0	0	0	0	0	0	0	0
Materials Engineering	0	0	0	0	0	0	0	0	0
Mechanical Engineering	64	18	34	7	44	14	17	28	226
Metallurgical Engineering	0	0	0	0	0	0	0	2	2
Systems Engineering	0	0	0	0	0	0	0	0	0
Technical Operations	4	4	8	8	38	4	7	4	77
Water Resources Eng.	0	0	0	0	0	0	0	0	0
Sub-Total	316	77	181	44	218	59	152	114	1,161
Forestry	77	22	22	11	14	6	6	19	177
Recreation and Park Admin.	75	43	33	19	66	21	48	42	347
Sub-Total	152	65	55	30	80	27	54	61	524

Major Course	Freshman (Semester) 1st	Freshman (Semester) 2nd	Sophomore (Semester) 1st	Sophomore (Semester) 2nd	Junior (Semester) 1st	Junior (Semester) 2nd	Senior (Semester) 1st	Senior (Semester) 2nd	Total
Accounting	30	4	20	10	9	7	8	1	89
Administrative Management	105	52	71	19	71	14	18	7	357
Economics	13	8	14	8	19	15	54	20	151
Engineering Management	0	0	0	0	0	0	0	0	0
Financial Management	49	12	29	15	13	7	2	2	129
Industrial Management	49	15	24	18	57	24	48	34	269
Management	0	0	0	0	0	0	0	0	0
Textile and Polymer Sci.	0	0	0	0	0	0	0	0	0
Textile Chemistry	4	1	4	1	3	0	6	1	20
Textile Science	4	2	5	2	1	1	6	1	22
Textiles	0	0	0	0	0	0	0	0	0
Sub-Total	254	94	167	73	173	68	142	66	1,037
Liberal Arts (Undeclared)	35	5	0	0	0	0	0	0	40
English	36	10	27	13	22	10	22	13	153
French	4	2	2	2	2	0	4	1	17
German	1	0	2	0	0	1	1	1	6
History	43	9	14	12	22	5	18	8	131
Political Science	52	20	39	12	24	14	38	8	207
Psychology	91	30	36	16	47	19	27	5	271
Sociology	38	6	15	5	19	6	8	7	104
Spanish	3	2	2	0	2	0	0	0	9
Sub-Total	303	84	137	60	138	55	118	43	938
Nursing (A.A.)	33	6	16	2	4	0	0	0	61
Nursing (B.S.)	76	8	31	4	18	4	3	0	144
Sub-Total	109	14	47	6	22	4	3	0	205
Biochemistry	0	0	0	0	0	0	0	0	0
Biology	52	10	10	3	11	7	2	3	98
Botany	3	1	4	1	3	1	2	0	15
Chemical Physics	0	0	0	0	0	0	0	0	0
Chemistry (B.A.)	4	0	2	0	3	0	2	0	11
Chemistry (B.S.)	19	2	9	3	10	3	11	5	62
Geology (B.A.)	0	0	0	0	1	0	0	3	4
Geology (B.S.)	4	0	3	1	3	0	3	3	17
Mathematics (B.A.)	25	0	6	1	5	3	3	2	45
Mathematics (B.S.)	59	10	43	6	17	6	19	2	162
Medical Technology	35	4	6	1	5	4	0	0	55
Microbiology	9	4	19	0	20	4	5	2	63
Physics (B.A.)	0	0	0	0	0	0	0	0	0
Physics (B.S.)	12	3	9	2	5	3	5	1	40
Pre-dentistry	43	9	21	4	21	4	10	1	113
Pre-medicine	99	9	43	3	31	10	42	6	243
Pre-pharmacy	22	5	9	1	1	0	0	0	38
Zoology	23	14	29	9	31	11	33	22	172
Sub-Total	409	71	213	35	167	56	137	50	1,138
Total	1,983	527	1,104	324	1,119	386	892	491	6,826

Graduate—Master's Level	971
Graduate—Ph.D. Level	137
Postgraduate	17
Non-Degree Students	14
Total	1,139
Grand Total	7,965
Greenville Campus	244
Sumter Campus	230
Off-Campus Institutes	323
MBA Program at Greenville	128
Total	925
Overall Total	8,890

(a) Includes two in first semester of the fifth year.
(b) Includes six in first semester of the fifth year.
(c) Includes five in the second semester of the fifth year.
(d) Includes two in the second semester of the fifth year.

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1889

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